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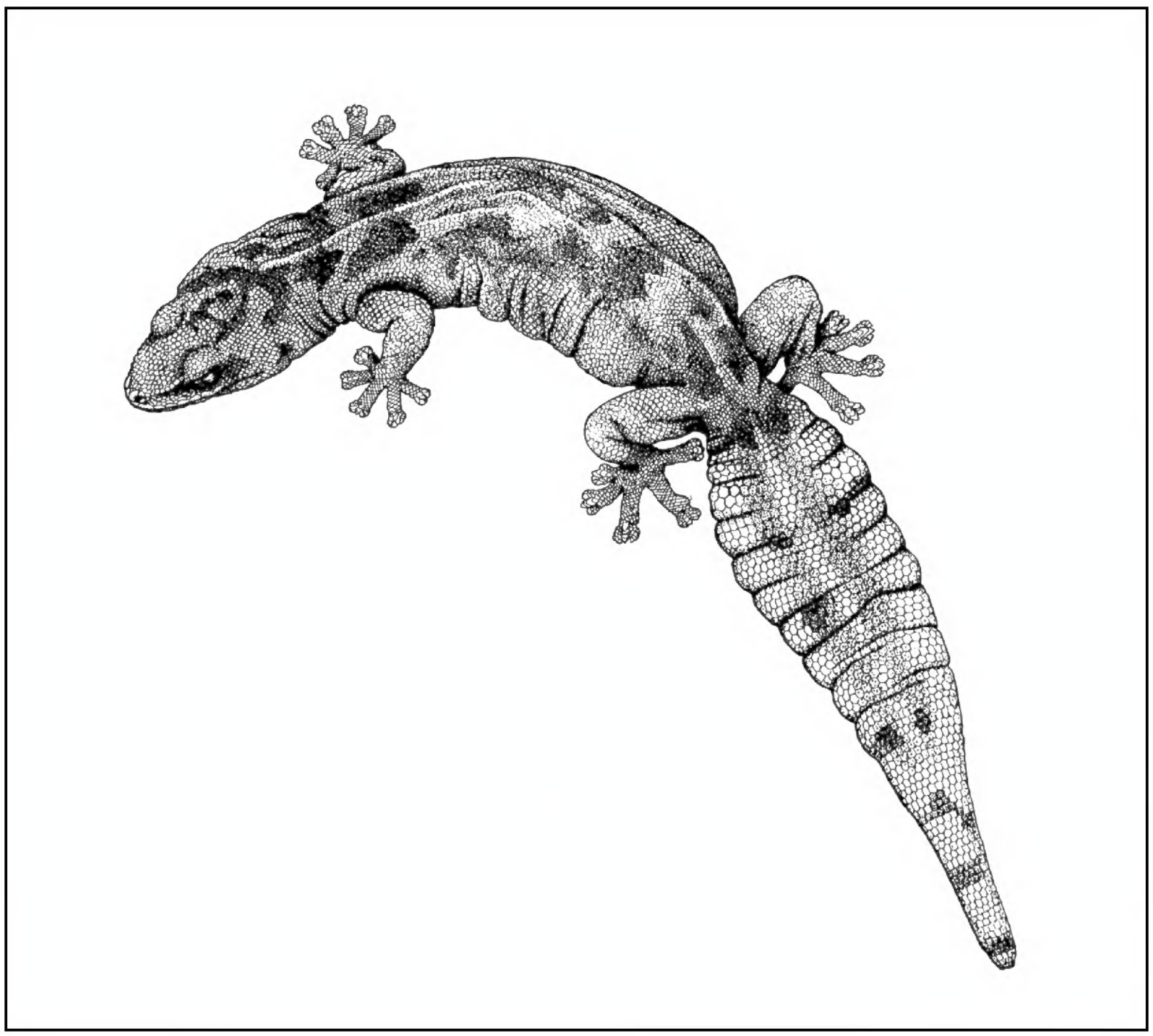

BULLETIN OF THE CHICAGO HERPETOLOGICAL SOCIETY
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Frog City: I. *Xenopus* leave-us . . . . . Ilene Sievert 1

Brown Snakes (*Storeria dekayi*) in South Central Iowa . . . . . Stephen R. Johnson and Mary Stark 2

Notes on Reproduction of Granite Spiny Lizards, *Sceloporus orcutti* (Squamata: Phrynosomatidae), from California . . . . . Stephen R. Goldberg 4

Herpetology 2013 6

Review: *The Tortoise* and *The Batagur*: Two Periodicals for Turtle Enthusiasts . . . . . David S. Lee 7

The Tympanum . . . . . Lena M. Lindén, Phil Bishop and Onnie Byers; Karen Eckert 9

Unofficial Minutes of the CHS Board Meeting, December 14, 2012 10

Advertisements 11

Chicago Herpetological Society Income Statement: January 1—December 31, 2012, and Balance Sheet, December 31, 2012 12

Cover: Bogert's rock gecko, *Afroedura bogerti*. Drawing (as *Afroedura karroica bogerti*) from *New Geckos of the Genera* Afroedura, *New Genus, and* Pachydactylus *from Angola* by Arthur Loveridge, American Museum Novitates Number 1254, April 8, 1944.

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In fond remembrance of Ilene Sievert, who died December 16, 2012, this year we will reprint several of the essays that Ilene wrote for these pages between 1988 and 1993 under the rubric "Frog City." This one is from June 1988.

Frog City
by Ilene Sievert

I. *Xenopus* leave-us

The high school biology teacher got himself a kit from some supply house. It included a pair of *Xenopus laevis*, food, instructions, and other materials for breeding these aquatic frogs in captivity. My daughter Carolyn reported that injections were used to bring the pair of adults to readiness. She did not see the mating but observed eggs and tadpoles. Metamorphosis occurred and close observation indicated extreme cuteness as an important young frog characteristic. Parental authorization was requested for further study at home. What could I say?

Years ago a "dwarf" clawed frog was purchased from a local aquarium shop. It was to live in a housekeeping position with some sedate and elderly newts. The newt habitat was a large plastic bubble terrarium with roughly hemispherical bottom, lid the same, with the top resting on a lip on the base. A hole on top of the lid let in air without giving up too much humidity. Inside, a layer of sand and gravel was covered with a few inches of water. Protruding rocks provided haul-out and sturdy semi-aquatic dracaenas often held a newt or two perched above the water. It was a quiet and peaceful Eden. A vigorous, energetic, or large animal would have pushed off the lid or jumped out the hole. Not newts.

An unkind person might say that, in respect to feeding, newts are slow and stupid. Much food was dropped, lost, drowned. Clawed frogs, on the other hand, seemed most assiduous in seeking and devouring. What I had seen in shop aquaria were tiny frogs, swimming nervously, fearfully, seeking food and looking harmless as guppies. In fact, there were some guppies in with the newts, but not for long. When first in the bowl Claudia kept well hidden, darting out for worms, brine shrimp, insect pieces, fish food. It was hard to find her in the rock crevices or under plants. Months passed and Claudia seemed much larger, suspiciously larger, and there seemed to be no more baby guppies. Off to the reference books we went to discover that there are distinctly non-dwarf *Xenopus* and they will and do try to eat anything that fits. Their voracity and toughness apparently make them a menace in non-native waters. Would Claudia know that newts can be indigestible? Were the poor old slow newts in danger?

She was no longer as secretive and could be seen lurking near the surface showing shallow pop-eyes shining with false innocence. The larger guppies had disappeared coinciding with a decided growth spurt for Claudia.

Although the newts seemed unconcerned, we moved Claudia to a separate aquarium, noting at the same time that (a) clawed frogs can jump very well and (b) they can travel quickly out of water. Soon a ten-gallon tank with lid was necessary. Water was kept shallow for her ease in breathing and our ease in changing. She liked to hide in a broken flower pot. A large smooth stone provided the entertainment of seeing her swoop terrestrial prey off the top. She always stuffed items in her mouth with splayed fingers, scoop . . . stuff, scoop . . . stuff. Long and recalcitrant nightcrawlers required a lot of palming. Small items just disappeared. We never saw her tongue at all. A slight touch of one of her fingers to a moving insect or fish caused a hair-trigger devouring reaction (scoop . . . stuff) but a strong stimulus or surprise caused a dramatic backward propulsion, often with a splash to the face. In a natural setting silt or mud must be stirred to obscure the frog's location. I would love to see a slow-motion film of that backward leap.

The book said that clawed frogs are easy to breed in captivity, so we looked about for a mate for Claudia. Because of some folds around the cloaca we concluded Claudia was a female. An ad in the CHS newsletter received a response from a member with a large adult, sex unknown. (It is the sex of the frog, not the member, that concerns us here. The accurate sexing and propagation of CHS members is too problematic and controversial a topic for treatment in this essay. We know that in certain seasons and times they can appear in large numbers, as if from nowhere. Certainly a great deal more research is necessary both in the lab and in the field.)

Thus arrived Claude. He was about one-quarter longer than Claudia. It is difficult to measure a live *Xenopus*. Imagine a frightened bar of wet soap.

Confusion! He also had cloacal folds, though somewhat different in appearance. Several semi-mavens then told us that sexing by cloacal appearance was iffy. We figured the frogs would know so we put them together and watched. They ignored each other for months. To avoid food wars they were well fed simultaneously. It seemed to me that Claudia tended to move away when Claude came near her, but at other times they were together like two drifting sticks, apparently mutually indifferent.

After a year Claudia died. She was found dead with no visible trauma or sign of disease, no previous unusual behavior observed. If only she'd sent a note. "*Dear Ilene, I try not to let it show but I really hate him. I think it's giving me an ulcer. See if you can find him a place of his own. Gratefully, Claudia*" We should have opened her up to find her real gender but were deterred by guilt and a certain smell.

Claude now lives alone in the ten-gallon tank. His appetite is good. When he arrived he had a curious truncation of some of his fingers. They looked bitten half off. They never regenerated but it seems not to impair sensitivity. He is my metaphor for slimy devouring monster. He truly appears to have no interests besides feeding and lurking. We never see any change of behavior by season or time of day. Great hunger brings some boldness. Do shy creatures in long solitary captivity simplify their

repertoire for lack of stimulus? They do not starve, compete, encounter predators, mate, dry out, chill or overheat. They cannot migrate. Is it hobo heaven or life sentence in solitary?

I don't think Claude misses Claudia. A smaller creature would be eaten. A much larger creature probably would be stressing. Perhaps he'd like a larger area than a ten-gallon tank in which to lurk. Security in the lurk place.

Carolyn brought home two little frogs. They hang in the water, stuffed doll arms outstretched, hind feet like tiny umbrellas. They locate the bits of crumbled Trout Chow. Scoop - stuff. Usually they keep toward opposite sides of the tank, skittering away if they accidently collide. I sense little sibling affection. The search for food is intense.

How many slimy devouring monsters does a household need?

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Brown Snakes (*Storeria dekayi*) in South Central Iowa

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We first became familiar with brown snakes (*Storeria dekayi*) in the late 1990s as we first encountered about a dozen spread over what is called the Volksweg, a paved biking and hiking trail near Pella, Iowa and skirting the only local feature viewable from near Earth orbit, Lake Red Rock Reservoir. In autumn, snakes came out to bask on the sun-warmed pavement. Back then when the snakes were more common we could walk the trail and see six to ten of them and if temperatures were just coming into the upper 40s we could pick up the snakes, as stiff as spaghetti noodles, place them into our hands and visibly see them "melt." As it soon turned out we had to visit the trails early to save these cold-inactivated snakes from harm from bicyclists and pedestrians.

During warmer periods in autumn when snakes were active we could document the differences in snake reactions to our presence. Most snakes retreated at our approach. About 30% struck defensive poses coiling while flattening and flaring their bodies to reveal stark white and red-gray checkerboard patterns. About 5% of snakes actually opened their mouths and lunged at us. This variability of behavioral response is in keeping with Darwinian variability as an underpinning of evolution. King (1997) in an investigation of variable parameters of snake morphological and small scale geographic ranges also suggests that another parameter of variability for *S. dekayi* may be behavioral.

Aside from viewing and photographing the snakes we also attempted to assist snakes off the pavement and edify passersby who might see the snakes and all too often, either through inattention or malice, killed many snakes. One morning we arrived too late and found five snakes crushed by shoes or bicycle tires. To enhance the education of the public about these (and hence other) snakes we collected two subadult snakes from the Volksweg in early autumn 2001. I (SRJ) kept them in a small aquarium so that we might observe some intricacies of their behavior. We were struck immediately by how these snakes basked twined together as if they enjoyed each other's touch. A 1936 article by H. J. Clausen relates how *S. dekayi* form aggregations when frightened but also form them due to other unspecified environmental stimuli. If these snakes were frightened they did not show it when presented with slugs.

At other times the snakes were hidden. We noticed one in a curled cottonwood leaf where much of the snake's body was hidden but two sections of snake extended from two openings in the curled leaf so that the whole image was one of a spoutless teapot with two handles.

Brown snakes are noted for their fondness for slugs and for worms as primary or secondary prey items (Christensen, 1990; Johnson, 2000; Tenant and Bartlett, 2000). An interesting small study of stomach contents of *S. dekayi* in Ontario (Judd, 1954) showed that snakes consumed three species of slugs (*Deroceras reticulatum*, *Arion hortensis* and *A. circumscriptus*), worms and also small Hemiptera. Our captive snakes were very fond of garden slugs (*Deroceras* sp. and *Arion* sp.) but paid absolutely no attention to worms no matter how small. I (SRJ) wondered if this categorical rejection of worms extended to the whole Red Rock Reservoir population of *S. dekayi*.

I (SRJ) used one of the snakes in my herpetology class in an effort to duplicate the teaching efforts of Whit Gibbons (1977), but hopefully with fewer memorable mishaps. Even though the snake was small the students gathered around the aquarium with obvious trepidation in their eyes. I had a 35 mm film canister

containing about three small garden slugs. While I told the students about the snake and its fondness for slugs I placed a small slug on my index finger intending to put it into the aquarium where the snake would find it and hopefully where students could observe it. While I talked and the slug wriggled I saw the students eyes get even wider. The snake saw the action of the slug, extended itself as much as possible and plucked the slug right off of my finger. The students were speechless! I like to think that they remember the harmless little snake from this close-up encounter.

The following spring, as soon as nighttime temperatures reached a constant of approximately 40°F or slightly higher, we released the snakes back to where we found them on the margins of the Volksweg trail.

South-central Iowa sits somewhat west of a borderline delineation of the distributions of two *S. dekayi* subspecies. In extreme eastern Iowa the dominant form is the midland brown snake (*S. dekayi wrightorum*) and in central Iowa the Texas brown snake (*S. dekayi texanum*) supposedly is dominant.

Tenant and Bartlett (2000) go on to suggest that in the gradient between these two distributions the populations intergrade while Christensen (1990) suggests that the differences in the two subspecies are not distinct and King (1997) documents much variation in scalation in Great Lakes populations of *S. dekayi* as well as variability in appearance. Though Lake Red Rock Reservoir should be well within the range of Texas brown snakes we saw nothing resembling a true Texas form. Instead these snakes look very much like midland brown snakes with only some suggestion of Texas brown snake intergradation. Chiefly some of the nominal midland snakes display more reddish pigmentation when they coil and flare and also have a more distinct middorsal stripe.

Since 2001 brown snakes have been harder to find. The apparent population decline may have many root causes. The killing of snakes by humans probably has some role, but recent weather patterns—particularly the most recent severe drought beginning in the summer of 2011—must have decimated their slug prey supply. Henry Fitch (2006) suggests that *S. dekayi* may have natural population cycles. On the University of Kansas Natural History Reservation outside of Lawrence, Kansas, *S. dekayi* was most common in the 1960s and steadily declined thereafter. The decline at Red Rock Reservoir seems a bit more sudden. Since 2001 I (SRJ) observed a single adult in a reasonably intact forest about a half-mile away from the place on the Volksweg where most snakes were encountered. In 2009 we rescued a subadult from the stretch of the Volksweg by that same remnant forest. We saw no snakes in 2010 and early spring 2011. In fact during the floods of 2008, 2010 and spring 2011 much of the Volksweg was closed—many areas underwater. Drought in summer 2011 and extending to the present must have affected these snakes. A little bit of late good news; we saw a single subadult with midland and Texas brown snake attributes on the stretch of the Volksweg in mid-October 2012.

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Notes on Reproduction of Granite Spiny Lizards, *Sceloporus orcutti* (Squamata: Phrynosomatidae), from California

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Abstract

The reproductive cycle of *Sceloporus orcutti* from California was examined utilizing a histological analysis of museum specimens. Males were reproductively active from March into June. Females were reproductively active in spring and early summer. There was no indication that *S. orcutti* females produce multiple clutches in the same reproductive season. Mean clutch size for 3 females was 8.7 ± 4.5 SD, range = 4–13. The timing of the *S. orcutti* reproductive cycle is similar to that of other North American lizards which also reproduce during the spring. New minimum sizes for male (83 mm SVL) and female (78 mm SVL) reproduction of *S. orcutti* in California are reported. A new minimum clutch size of 4 eggs is reported for *S. orcutti*.

The granite spiny lizard, *Sceloporus orcutti* Stejneger, 1893, ranges from the north side of the San Gorgonio Pass (between the San Bernardino and San Jacinto mountain ranges of Southern California) southward on the Peninsula Ranges to near the tip of Baja California, Mexico (Stebbins and McGinnis, 2012). The biology of *S. orcutti* is summarized in Weintraub (1980). The definitive works on reproduction of *S. orcutti* are by Mayhew (1963a, b). Anecdotal information on *S. orcutti* reproduction is in Shaw (1952); Stebbins (1954, 2003); Behler and King (1979); Lemm (2006); Dugan (2009); Stebbins and McGinnis (2012). Goldberg (2011) reported minimum sizes for reproductive maturity of *S. orcutti* from Baja California Sur, Mexico. The purpose of this paper is to provide additional information on the reproductive cycle of *S. orcutti*. A new minimum clutch size for *S. orcutti* and new minimum sizes for male and female reproduction in California are reported.

Methods

A sample of 62 *S. orcutti* consisting of 19 adult males, (mean snout–vent length, SVL = 93.2 mm ± 6.6 SD, range = 83–110 mm), 24 adult females (mean SVL = 87.1 mm ± 4.7 SD, range = 78–98 mm), 19 juveniles (mean SVL = 48.9 mm ± 13.2 SD, range = 34–76 mm) from California was examined from the herpetology collection of the Natural History Museum of Los Angeles County (LACM), Los Angeles, California, USA. *Sceloporus orcutti* were collected 1947–1968. Specimens examined by California county are in the appendix.

A small incision was made in the lower part of the abdomen and the left gonad was removed for histological examination. Enlarged ovarian follicles (> 5 mm) or oviductal eggs were counted. Gonads were embedded in paraffin, sections were cut at 5μm, and stained with Harris hematoxylin followed by eosin counterstain (Presnell and Schreibman, 1997). Histology slides were deposited in LACM. An unpaired *t*-test was used to test for differences between male and female SVLs using Instat 3 (Graphpad, San Diego, CA).

Table 1. Monthly stages in testicular cycle of 19 *Sceloporus orcutti* from California.

Month	n	Regressed	Recrudescence	Spermiogenesis
February	1	0	1	0
March	1	0	0	1
April	7	0	0	7
May	5	0	0	5
June	1	0	0	1
July	1	1	0	0
August	1	1	0	0
September	2	1	1	0

Results

The mean body size (SVL) of my male sample was significantly larger than the mean of my female sample (unpaired *t* test, $t = 3.6$, $df = 41$, $P = 0.001$). Monthly stages in the testicular cycle are in Table 1. Three stages in the testicular cycle were present: (1) regressed, seminiferous tubules are at their smallest sizes and contain spermatogonia and interspersed Sertoli cells; (2) recrudescence, a proliferation of germ cells for the next period of spermiogenesis is evident, as primary and secondary spermatocytes are present; (3) spermiogenesis, lumina of the seminiferous tubules are lined by sperm or clusters of metamorphosing spermatids. The period of spermiogenesis encompassed March through June (Table 1). Testicular recrudescence commenced in September and continued into February (Table 1). The smallest reproductively active male (spermiogenesis in progress) measured 83 mm SVL (LACM 182409) and was collected in Riverside County in April.

Four stages were present in the ovarian cycle (Table 2): (1) quiescent, no yolk deposition in progress; (2) early yolk deposition; (3) enlarged ovarian follicles (> 5 mm); (4) oviductal eggs. Females were reproductively active from April into July (Table

Table 2. Monthly stages in the ovarian cycle of 24 *Sceloporus orcutti* from California. * = one July female with an incomplete clutch of oviductal eggs.

Month	n	Quiescent	Early yolk deposition	Follicles > 5 mm	Oviductal eggs
March	3	3	0	0	0
April	12	10	2	0	0
May	3	0	1	1	1
June	3	1	1	1	0
July	2	0	1	0	1*
August	1	1	0	0	0

2). Mean clutch size for 3 females was 8.7 ± 4.5 SD, range = 4–13. Clutch sizes were 4, 9 and 13 eggs. There was no suggestion (oviductal eggs and concurrent yolk deposition) in the same female to suggest more than one clutch was produced in the same reproductive season. The smallest reproductively active female measured 78 mm SVL (LACM 52927) and was collected in June in Riverside County.

Discussion

It is not known if the one *S. orcutti* female from July with early yolk deposition would have produced a clutch of eggs. Females which commence yolk deposition late in the reproductive season may not complete the process, with eggs undergoing atresia (degeneration with reabsorption of yolk) (Goldberg, 1973). Highest incidences of follicular atresia were noted near the end of breeding in July for *S. vandenburgianus* (as *Sceloporus graciosus*) (Goldberg, 1975).

My data support the findings of Mayhew (1963a) that *S. orcutti* is a spring breeder that produces one clutch of eggs. Timing of reproduction in *S. orcutti* is similar to numerous other phrynosomatid lizards from western North America that also reproduce during spring, see for example, *Dipsosaurus dorsalis* (Mayhew, 1971), *Sceloporus occidentalis* (Goldberg, 1974), *Sceloporus vandenburgianus* (Goldberg, 1975). However, both *S. occidentalis* and *S. vandenburgianus* may produce 2 egg clutches in the same reproductive season. The large number (10/12, 83%) of reproductively inactive female *S. orcutti* from April likely indicates most females commence reproduction in May. Mayhew (1963a) reported female *S. orcutti* began yolk deposition in late April. There are differences in the minimum sizes for reproduction for *S. orcutti* in Mayhew (1963a) (females, 85 mm SVL, males 90 mm SVL) versus (78 mm SVL for females, 83 mm SVL for males) reported herein. Goldberg (2011) reported even smaller *S. orcutti* from Baja California Sur, Mexico were reproductively active (70 mm SVL for females, 68 mm SVL for males). Both Stebbins (2003) and Stebbins and McGinnis, (2012) reported a minimum clutch size of 6 produced by *S. orcutti*. My findings of a clutch of 4 eggs (LACM 182406) represents a new minimum clutch size for *S. orcutti*.

Acknowledgment

I thank G. Pauley (LACM) for permission to examine *S. orcutti*.

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Appendix

Specimens of *Sceloporus orcutti* from California (by county) examined from the Natural History Museum (LACM) of Los Angeles, California.

Orange: LACM 27195, 27196, 97221-97227; **Riverside**: LACM 18792-18794, 18797, 18799, 18801, 18802, 18804-18806, 18809, 18810, 18812, 18814, 18817, 18819, 18823, 18825, 18828, 27193, 27194, 52918, 52921-52923, 52925-52929, 73584, 73585, 73697-73699, 182406, 182408-182410, 182412-182415, 182417, 182418; **San Diego:** LACM 4687, 18877, 52917, 97323-97326, 97328.

Bull. Chicago Herp. Soc. 48(1):6, 2012

Herpetology 2012

In this column the editorial staff presents short abstracts of herpetological articles we have found of interest. This is not an attempt to summarize all of the research papers being published; it is an attempt to increase the reader's awareness of what herpetologists have been doing and publishing. The editor assumes full responsibility for any errors or misleading statements.

NIGHTSNAKE PREY CHEMICAL DISCRIMINATION

R. E. Weaver et al. [2012, J. Herpetology 46(4):523-526] investigated responses of adult and juvenile desert nightsnakes (*Hypsiglena chlorophaea*) to odor extracts of potential invertebrate and vertebrate prey. Snakes were collected during 2009 from three localities in Washington State. Odors were obtained from three potential invertebrate prey—spider (*Tegenaria* spp.), scorpion (*Paruroctonus boreus*) and field cricket (*Gryllus* spp.). Responses were compared with response to a vertebrate prey item, a western terrestrial gartersnake (*Thamnophis elegans*). All potential prey items were collected at the same site as *H. chlorophaea*. Odors were presented on 15-cm cotton swabs held 2.5 cm in front of the snake's snout. Recorded in each trial were the number of tongue flicks in 60 sec, the latency to first tongue flick, and whether the stimulus elicited an attack. No significant difference was observed in latency of responses between spider, scorpion, cricket, or snake odors. However, both adult and juvenile *H. chlorophaea* responded with higher tongue-flick rates to snake odor. Juveniles showed an increase in tongue-flick rate toward crickets. Attacks were made against snake odor with no difference between adult and juvenile responses. The results indicate that adults and juveniles of *H. chlorophaea* do not feed on invertebrates, and in some cases invertebrates may pose a threat to small snakes such as *H. chlorophaea*. However, the diet of *H. chlorophaea* may vary geographically, and populations of *H. chlorophaea* with a more southerly distribution may feed on invertebrates. Whether such differences in diet exist between populations will remain unresolved until additional studies of the diet of southern populations of *H. chlorophaea* are compared with those of northern populations.

FOXSNAKE HABITAT USE

J. J. Shew et al.[2012, J. Herpetology 46(4):539-548] note that knowledge of movements, habitat use and resource requirements is critical to designing management strategies for species with a conservation status. For snakes, basic research needed to derive this information is often lacking or insufficient. The spatial ecology and habitat use of 21 adult western foxsnakes (*Pantherophis vulpinus*) were investigated using radio telemetry during a single activity season at Squaw Creek National Wildlife Refuge in northwest Missouri, near the species' southern range limit. At the landscape level, monitored snakes located their home ranges in lowland areas in association with wet prairies and managed wetlands but avoided agricultural plots and were not observed to occupy upland areas. Snakes were not selective of macrohabitat within their home ranges but selected microhabitats with denser herbaceous vegetation than typically available at random sites, suggesting that snakes were responding mainly to microhabitat features at the home-range level. Unlike many other temperate snake species, *P. vulpinus* did not exhibit any sexual differences in selection of microhabitats because all snakes appeared to prefer dense vegetative structure. Home-range sizes were relatively large in comparison to many other terrestrial temperate colubrids and seemed to be explained by resource distribution patterns, such as the proximity of hibernacula and oviposition sites to foraging habitat. Movement patterns varied seasonally among sexes with males demonstrating peak movement distances in May and females in July, respectively. Management decisions to minimize habitat manipulations during the snake activity season and protect embankments used for hibernacula and oviposition will likely benefit foxsnake conservation.

Bull. Chicago Herp. Soc. 48(1):7-9, 2013

Review: *The Tortoise* and *The Batagur*: Two Periodicals for Turtle Enthusiasts

David S. Lee
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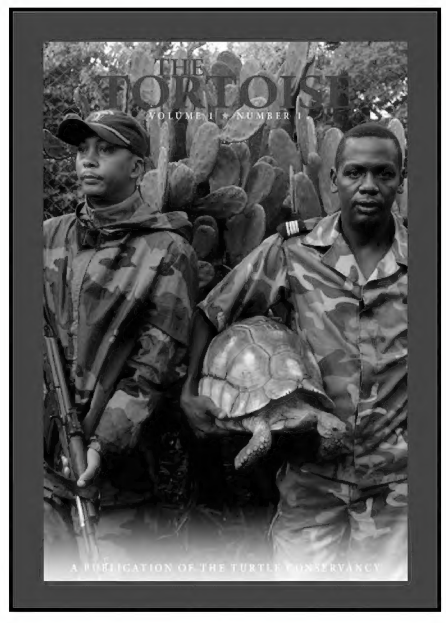
In the last year, two new chelonian journals have appeared, and while quite different in focus and scope, each fills a needed niche. Despite any number of long-standing English language scientific journals dedicated to reptiles and amphibians and a few specializing in just turtles, accurate and up-to-date published information that is accessible to those who are not primarily research-oriented has remained limited. There are, of course, newsletters and periodical publications produced by local herpetological societies and regional turtle clubs, but their content is typically a hodgepodge of information regarding meetings, notices of events, abstracts of scientific papers published elsewhere, annual elections of officers, and other news items. Turtle hobbyists also have publication outlets but the English language ones are limited to those offering articles very elementary in nature and are used primarily to promote products being offered by advertisers. The European community addressed these issues years ago and they produce a number of high quality journals and magazines that appeal to educated audiences of turtle enthusiasts, conservationists, and hobbyists. And while these new US-based publications will also clearly be of interest to the academic research community, their value lies in their broad appeal to anyone with a passion for turtles.

The inaugural issue of *The Tortoise* is 160 pages in length and comprises 14 original, individually authored articles. All the articles in this issue are conservation oriented, and most address endangered and critically endangered species. Two are about the Turtle Conservancy and The Behler Conservation Center, and two discuss the trade in wild-caught turtles. Most of the others are about specific species (over 10 in this first issue) or places-- with geographic coverage including the United States and Mexico, Madagascar, South Africa, Southeast Asia and the Galápagos. The journal's pages are loaded with high quality color photographs that complement the text. Many of the authors' names will be recognized by anyone with even a casual interest in turtles, while others appear to be new to the community. I was particularly surprised and pleased to see an article co-authored by David and Lida Burney. I had met them years back when we were both working for state government in North Carolina. David was a naturalist for the state park system and I was curator of birds for the state museum. None of us would have guessed that 35 years later we would be working with turtles.



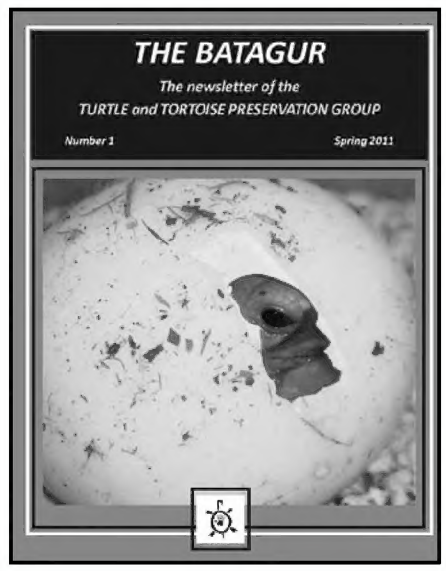
The Burneys are two of four authors on a most interesting article that describes a rather back-handed conservation program. They are using orphaned sulcata tortoises (*Centrochelys sulcata*) to control invasive exotic plants in Hawaii. Hawaii faces any number of conservation issues that lead to extinctions of island endemics, and well-established exotic plants that prevent re-growth of native forest continue to be a major problem. As it turns out the authors' understanding Hawaii's fossil record enabled them to demonstrate that there were once non--mammalian grazing creatures and over time Hawaii's native vegetation developed chemical protective mechanisms against them. Conversely, the introduced continental plants coevolved with grazing mammals and developed defenses against goats, sheep, and cows and these are the plants that tend to take over in human controlled landscapes. Because of this the tortoises can be safely used as living weed eaters, ignoring the native species and eating the introduced ones. This in turn eliminates the need for the staff members and volunteers at nature reserves to devote countless hours to weed control. With the help of the tortoises the natural forest is regenerating. The article reports on an experiment that appears to be working, and shows promise for use in exotic plant control on other oceanic islands. It is refreshing to see that here is at least one case where an ongoing ecological disaster is brought under control through the unscrupulous marketing by the pet trade. Until now the only redeeming value of pet trade sulcatas was that they at least reduced the demand for wild-caught tortoises, and families purchasing one would never ever again be interested in purchasing a pet tortoise of any species. It is informative to see that how the global experiences from a number of seemingly unrelated disciplines came together to generate this program.

The authors go into depth in explaining the overall background of the story to the reader. The distribution of these tortoises and their long-term protection resulting from food taboos under an Islamic culture and Sharia Law, the recent in-range conservation program initiated by Bernard Devaux, and the history of sulcatas in the pet trade with their induction into a market where buyers naive to their rapid growth and adult size created a scenario where large numbers of these tortoises are available for adoption are all part of the story line. In addition the Burneys are paleontologists, and in explaining the success of the program they weave a number of biological concepts into the text. This is typical of this issue's other articles as well; the presentations are well thought out, and not simply strings of science facts crammed into paragraphs.

It's refreshing to see that biologists are willing to step outside the security of academic peer-reviewed journals and present information in a readable format. These are well-written, well-illustrated articles presenting timely and new information. The publication bridges the gap between journal and magazine

formats. Its first rate science, but the pages are not bogged down with traditional references to figures, tables of data, sections devoted to results and methods, acronyms, and endless literature citations. This is good journalism, the articles are comprehensive and each written by people who personally are involved with their subject. The only other popular turtle publication that comes close to *The Tortoise* in content and style is the French *La Tortue*. It, too, carries a strong conservation component and highlights regional cultural aspects relating to turtles and tortoises.

As Eric Goode states in his introductory remarks in the first volume "The conservation community cannot continue to conduct business as usual. Many of the traditional conservation strategies for turtles and tortoises are not working." With no other order of vertebrates currently facing such a vast total percentage of extinction risk something needs to be done and this will involve working with the private sector. This journal has set the stage for this to happen.



The Batagur, while focusing on the husbandry and breeding of captive tortoises and freshwater turtles, has an overriding theme of turtle conservation. Indeed, if we are to be successful in our conservation efforts all available options need to be kept open, and captive breeding is clearly a means to insure that various species do not disappear, and the existence of captive colonies leaves open our options for repatriation. Actually this publication appeared earlier—in the late 1990s—but its format and style were entirely different.The current installment of *The Batagur*, issued in the spring of 2011, is 63 pages in length. The 13 articles in this issue cover a variety of topics that are presented from a number of perspectives. Four address the husbandry and breeding of three little known species and three are on general husbandry and health-related topics that will be of interest to anyone maintaining captive collections of turtles and tortoises. One article provides historical perspectives on how the private sector has through captive breeding contributed to saving various mammals and birds from extinction. One article directly addresses turtle conservation issues, and another provides information on a grant funded by the Turtle and Tortoise Preservation Group to study both wild and captive diets of Egyptian tortoises. This issue also contains a nice photo essay showing successful captive breeding of 17 various turtle and tortoise species, most of which are species of major conservation concern. In addition there are messages from Russ Gurley, the founder of the TTPG, and another from Nigel Marven. Dennis Uhrig is recognized as a member of the organization who recently had a subspecies of *Trachemys* named after him and there is a two-page species profile on *Leucocephalon yuwonoi*.

By far the first issue's most comprehensive article is one by Harald Artner on the first successful breeding of the Pantanal swamp turtle, *Acanthochelys macrocephala*. The species was just recently described and the article reviews the turtle's description, and what is known of its distribution and natural and taxonomic history. The remainder of the well illustrated, 12-page article discusses maintenance in captivity, the reproductive biology of the turtle and information regarding the tricky incubation protocol Artner developed. Artner is a well-known European turtle keeper. The other authors are also mostly from the private sector but there are ones who are recognized professional biologists and zoo curators.

While this first issue was published in 2011, I did not actually see a copy until 18 months after it appeared, when I was asked to review it. To my surprise I discovered that I had authored one of the articles and coauthored another. These were both ones previously appearing in other publications, and while I have no problem with this, it is not clear how many of the articles in this first issue are original. My only criticism of *The Batagur* is the number of advertisements that appear throughout the pages, but all are of recently published books or ones for products that should be of interest to the members of the organization. And the economics of this are understandable; the ads make possible the publication as well as help to keep the subscription cost reasonable. As a true testament to the organization's commitment to turtle conservation, at their last board meeting (November 2012) it was decided to come to the finical rescue of the African Chelonian Institute in Senegal. They agreed to help complete funding of one of the Institute's projects. The TTPG board voted for its organization to make up the difference previously promised from another organization so that the project could continue. The TTPG is a 501(c)3 nonprofit that has been in existence since 1996, and despite the fact that it is composed primarily of private sector hobbyists, collectively their membership has bred, and are breeding, more individuals and species of turtles than all the world's zoos and similar organizations combined. A great many of the species in this collective holding represent some of world's most endangered species. It is gratifying that they are willing to share their knowledge. Perhaps because of this publication the conservation community will begin to appreciate the potential contribution this private sector community can make to future and ongoing conservation programs.

Radiata, a German publication, and *Cheloniens* and *Manouria*, both successful French journals, all focus on providing information to turtle hobbyist, the only current US publication that comes close to doing this is *Reptiles* magazine. Of course it is more generalized and covers all species of reptiles and amphibians. *Reptiles*, however, is a commercial trade magazine, and its mission is to support advertisers and the articles it publishes are directed toward children and families who purchase animals from pet stores. Conservation and natural history information is all but lacking and the articles are consistently broken up with paid advertising. While it is totally unfair to *The Batagur* to compare it to *Reptiles* magazine, I bring this up because it illustrates the large void that the TTPG can fill.

The Tortoise and *The Batagur* are each welcome publications to those of us with more than a passing interest in chelo-

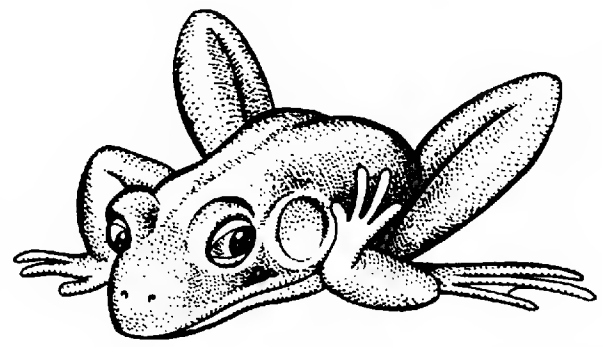
nians. I expect that most subscribers will quickly attain new levels of appreciation of modern day turtle conservation efforts as well as a better understanding of the pioneering methodologies being developed by the serious members of the herpetoculture community. Even a quick scanning of these journals shows that despite quite different approaches there is much overlap and shared interest. As can be seen in first issue of *The Tortoise* one of the key strategies of the Turtle Conservancy is the establishment of assurance colonies of rare turtles. The fact that they share this common interest with the hobbyist was demonstrated by their participation in the third annual meeting of the Turtle and Tortoise Preservation Group. *The Tortoise* and *The Batagur* are not scientific journals. They are publications that share important information on turtles and tortoises and the people who have the passion to help them.

Both publications defy classification. They are periodicals published by organizations and available to their respective members. In many ways they have magazine formats, with *The Tortoise* perhaps closely resembling *National Geographic* in style, and the editors refer to the publication as a magazine. The editors of *The Batagur* are calling their publication a newsletter, but the format of the articles mostly follow a style one would expect to see in scientific journals, while the glossy pages and incorporation of photographs and ads make it magazine-like in overall appearance. Whatever terminology one uses for these periodicals is irrelevant, as these two publications should do much to advance our knowledge of turtles and we all wish them success.

The Tortoise and *The Batagur* are available to members of the organizations that publish the respective journals. Membership in the Turtle Conservancy is $100 a year and in addition to the journal dues includes a monthly e-mail newsletter, and copies of Turtle Conservancy films. The bulk of the membership cost provides a direct contribution to meaningful conservation efforts. For membership, write to The Turtle Conservancy, 49 Bleecker St, Suite 601, New York, NY 10012, or email them at membership@turtleconservancy.org. Membership in the Turtle and Tortoise Preservation Group is $30 a year. In addition to publishing *The Batagur* this group also sponsors a web site, provides e-mail updates and surplus lists for members, supports conservation programs, and hosts an annual fall meeting each November in Phoenix, Arizona. See www.ttpg.org.

Bull. Chicago Herp. Soc. 48(1):9, 2013

The Tympanum



We are writing to express our sincere thanks for the Chicago Herpetological Society's contribution of US$ 1,000.00 to support the global coordination of the Amphibian Ark. Amphibians are a critical part of healthy ecosystems and your contribution will help us protect those in danger of extinction. We are very grateful for your support.

As a joint effort of the World Association of Zoos and Aquariums, the IUCN/SSC Conservation Breeding Specialist Group, and the JUCN/SSC Amphibian Survival Alliance, the Amphibian Ark is working to facilitate the response of the zoo and aquarium community to the current amphibian extinction crisis. As you know, more than a third of amphibian species are threatened, with many facing imminent extinction if no actions are taken. For those amphibian species that cannot currently be saved in nature, the Amphibian Ark is coordinating with zoos, aquariums, and other institutions around the world to place these animals in biosecure facilities for safekeeping and breeding until the threats to the wild populations can be controlled. We help to provide the needed coordination of these efforts, along with training, technical assistance, and publicity that will help all organizations to conduct effective and efficient amphibian conservation programs. Since 2006, we have assessed 38% of all amphibian species (52% of the threatened amphibian species) for their conservation needs. We are currently tracking over 100 priority amphibian species in captivity.

Our ultimate vision is *the world's amphibians safe in nature*. You can find out more about our activities, by visiting our web-site www.amphibianark.org.

We have been able to respond appropriately and quickly to this high profile conservation crisis because we have support from organizations such as yours. With your help and commitment, the Amphibian Ark will continue to help the *ex situ* community use their considerable expertise to help amphibians. Thank you again for your valued contribution.

Most sincerely,

Lena M. Lindén, World Association of Zoos and Aquariums
Phil Bishop, Amphibian Survival Alliance
Onnie Byers, Conservation Breeding Specialist Group

Happy Holidays! Thank you, thank you for your donation of US$ 1,000 to the Wider Caribbean Sea Turtle Conservation Network (WIDECAST)! Your gift is deeply appreciated, as it enables us to continue our important conservation work. Truly, what would we do without you guys?! The donation will be allocated in its entirety to assisting local Caribbean sea turtle conservationists in attending the 2013 Annual Meeting of WIDECAST and the 2013 International Symposium on Sea Turtle Biology and Conservation that will follow it in February.

The funds have arrived just in time!

With sincere gratitude,

Karen Eckert, WIDECAST, Inc.

Unofficial Minutes of the CHS Board Meeting, December 14, 2012

The meeting was called to order at 8:25 P.M. at the home of Linda and Andy Malawy. Board members Lawrence Huddleston, Deb Krohn and Cindy Rampacek were absent.

Officers' Reports

Recording Secretary: The minutes of the November 16, 2012, board meeting were read and accepted.

Treasurer: The November financial report was presented, discussed and accepted.

Membership Secretary: Membership numbers are holding steady around 500. A list of newly expired memberships was read.

Publications Secretary: The remaining *Bulletin*s from 2006, and the one from September 2012 have been added to the website. Stephanie's email has been set up. Aaron needs info for the Junior Herpers' page. Jason and Stephanie will send him content.

Sergeant-at-arms:Attendance at the November general meeting was 38.

Committee Reports

Shows:
• Notebaert, first full weekend of each month. Josh Chernoff is coordinator.
• Great Lakes Pet Expo, Wisconsin Exposition Center, Milwaukee, February 2, 2013.
• Chicagoland Family Pet Expo, Arlington Park Racecourse, March 15–17, 2013.

Old Business

Junior Herpers club: There were 30 at the first meeting. The January speaker will be Stephanie Cappiello.

New Business

Grants: Applications have been arriving. Stephanie Cappiello and Jim Foster asked to be included in the committee.

Book sales: Our October speaker left us some of his books and would like us to sell them and keep half of the proceeds. Mike Dloogatch suggested it would simplify record keeping to send him a check now. Mike moved to send the check, Andy seconded. After discussion, the motion passed unanimously.

Round Table

.Mike Scott would like to have decals made with the CHS logo, and is asking for board approval to use the logo. He will have samples made for approval.

Jason Hood has a source for keychains, and wanted to know if we should have some made for 'Fest as giveaways.

Mike Dloogatch pointed out that now have a new rattlesnake in the Southwest due to splitting of the black-tailed rattlesnakes into two species

Stephanie reported that Barb made her a cute turtle for Christmas.

Nancy said that Barb made her a cute Christmas present, too.

Jason and Barb are hoping to buy a house soon.

The meeting was adjourned at 9:27 P.M.

Respectfully submitted by recording secretary Jenny Vollman

Advertisements

For sale: rats and mice—pinkies, fuzzies and adults. Quantity discounts. Please send a SASE for pricelist or call Bill Brant, *THE GOURMET RODENT*, PO Box 430, Newberry, FL 32669-0430, 352-472-9189, E-mail: GrmtRodent@aol.com.

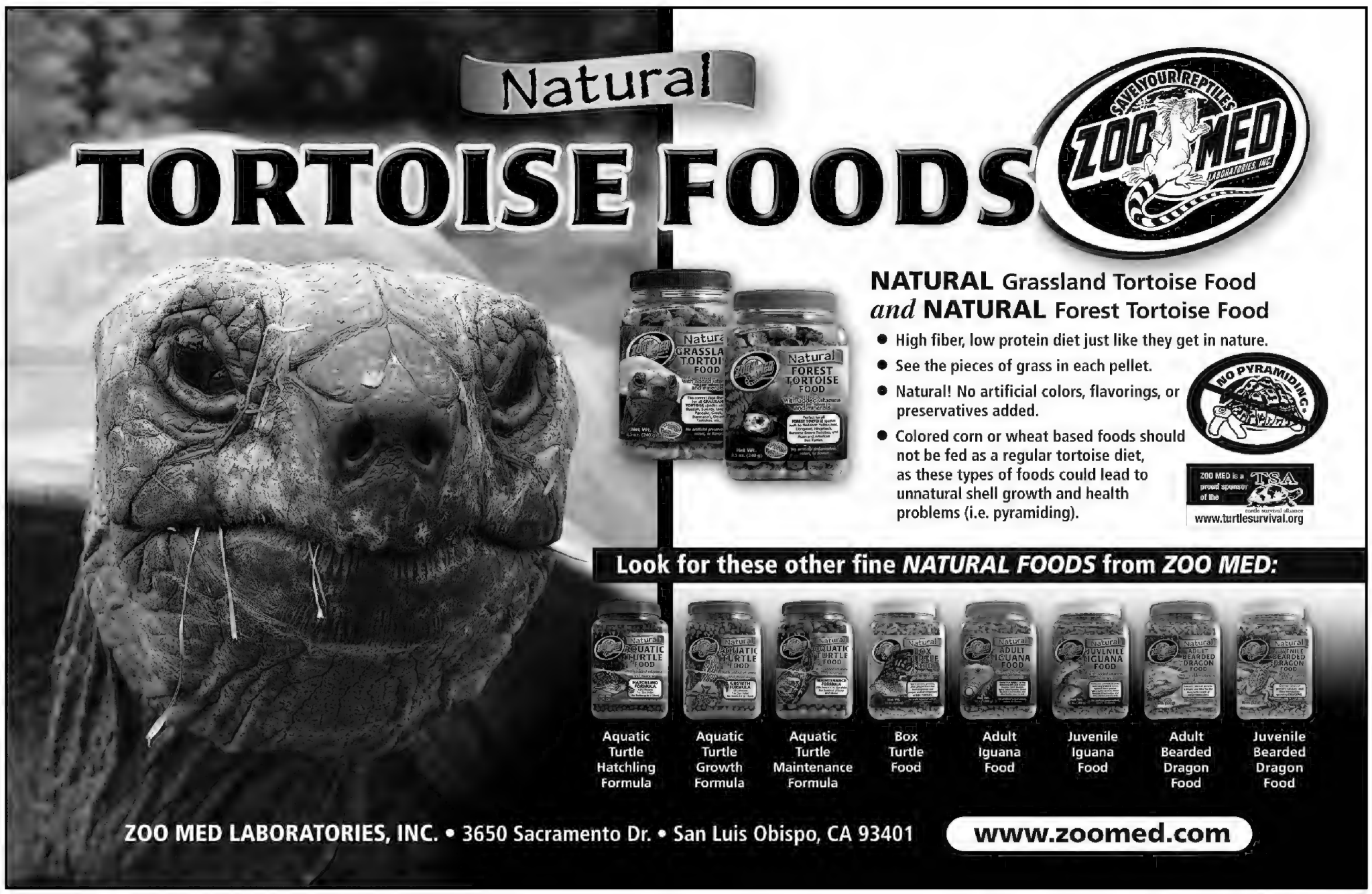
For sale: **highest quality frozen rodents**. I have been raising rodents for over 30 years and can supply you with the highest quality mice available in the U.S. These are always exceptionally clean and healthy with no urine odor or mixed in bedding. I feed these to my own reptile collection exclusively and so make sure they are the best available. All rodents are produced from my personal breeding colony and are fed exceptional high protein, low fat rodent diets; no dog food is ever used. Additionally, all mice are flash frozen and are separate in the bag, not frozen together. I also have ultra low shipping prices to most areas of the U.S. and can beat others shipping prices considerably. I specialize in the smaller mice sizes and currently have the following four sizes available: Small pink mice (1 day old—1 gm) , $25 /100; Large pink mice (4 to 5 days old—2 to 3 gm), $27.50 /100; Small fuzzy mice (7 to 8 days old—5 to 6 gm) , $30/100; Large fuzzy mice / hoppers (10 to 12 days old—8 to 10 gm), $35/100 Contact Kelly Haller at 785-234-3358 or by e-mail at kelhal56@hotmail.com

For sale: High quality, all locally captive-hatched tortoises, all bred and hatched here in the upper midwest. Baby leopards, Sri Lankan stars, and pancakes usually available, and are all well-started and feeding great! Leopards are $125 ea., Sri Lankans (2012 hatched) $475 ea. And Pancakes are $195 ea. Leopards for out of state sale/shipping require a veterinary health certificate (inquire for cost). E-mail at KKranz1@wi.rr.com or call Jim or Kirsten at 262 654 6303.

Herp tours: **Costa Rica herping adventures**. Join a small group of fellow herpers for 7 herp-filled days. We find all types of herps, mammals, birds,and insects, but our target is snakes. We average 52 per trip, and this is our 10th year doing it. If you would like to enjoy finding herps in the wild and sleep in a bed at night with air-conditioning, hot water and only unpack your suitcase once, instead of daily, then this is the place to do it. Go to our web-site http://hiss-n-things.com and read the highlights of our trips. Read the statistics of each trip and visit the link showing photos of the 40 different species we have found along the way. E-mail at jim.kavney@gmail.com or call Jim Kavney, 305-664-2881.

Herpetological Researcher/Educator Internships: Research 4 Reptiles, LLC. is seeking two volunteer interns, ages 18 years and older, for the Summer 2013 season to assist in all aspects of herpetological research and educational classes. Our mission is to provide challenging, hands-on, field-based programs for participants ages 12 years and older to inspire enthusiasm for and understanding of native Illinois reptile and amphibian species. All educational programs are taught entirely outdoors at Midewin National Tallgrass Prairie in Wilmington, Illinois, and are limited to 8 participants. Internship details can be found on our website at: http://www.research4reptiles.biz. Email Holly Zak at research4reptiles@comcast.net or call 630-337-0757 for questions.

Line ads in this publication are run free for CHS members—$2 per line for nonmembers. Any ad may be refused at the discretion of the Editor. Submit ads to mdloogatch@chicagoherp.org.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Chicago Herpetological Society
Income Statement: January 1 – December 31, 2012

Income		Expense	
Adoptions	$ 1,015.00	Adoptions	$ 369.86
Grants	40.00	Grants	8,500.00
Membership dues	12,286.50	Bulletin printing / mailing	13,402.16
ReptileFest	48,559.40	ReptileFest	19,324.14
Merchandise sales	702.00	Cost of merchandise	487.50
Other CHS shows	50.00	Bank / PayPal fees	103.35
Interest	36.38	Junior Herpers club	464.81
Donations (unrestricted)	632.00	Donations (conservation)	5,000.00
Bulletin back issues	142.50	Liability Insurance	3,066.00
Bulletin ads	456.00	Equipment and supplies	67.96
Raffle	1275.00	Licenses and Permits	441.89
		Postage	2,111.68
		Membership related	1,138.80
		Speaker reimbursement	2,130.48
		Telephone	150.00
Total Income	$65,194.78	Total Expense	$56,758.63

Net Income $8,436.15

Chicago Herpetological Society
Balance Sheet: December 31, 2012

Assets	
Checking	$ 5,283.80
Money market	51,489.93
PayPal	977.13
Postage on deposit	384.82
Total Assets	$58,135.68
Equity	
Restricted – Adoptions	$ 5,833.85
Restricted – Grants	5,000.00
Retained Earnings	38,865.68
Net Income	8,436.15
Total Equity	$58,135.68

UPCOMING MEETINGS

The next meeting of the Chicago Herpetological Society will be held at 7:30 P.M., Wednesday, January 30, at the Peggy Notebaert Nature Museum, Cannon Drive and Fullerton Parkway, in Chicago. **Ray Pawley** will speak at this meeting. Ray is a retired curator of reptiles at Brookfield Zoo, who now makes his home near Hondo, New Mexico. Ray's talk will cover "Brookfield Zoo Reptile House Techniques and Strategies That You Might Not Have Known About." This will be a report on techniques, methods and management protocols that Ray developed over the years at the Lincoln Park and Brookfield Zoos for captive herps.

Speaking at the February 27 meeting will be **Dustin Rhoads**, author of *The Complete Suboc*. Dusty will speak about his favorite topic, trans-Pecos ratsnakes.

The regular monthly meetings of the Chicago Herpetological Society take place at Chicago's newest museum—the **Peggy Notebaert Nature Museum**. This beautiful building is at Fullerton Parkway and Cannon Drive, directly across Fullerton from the Lincoln Park Zoo. Meetings are held the last Wednesday of each month, from 7:30 P.M. through 9:30 P.M. Parking is free on Cannon Drive. A plethora of CTA buses stop nearby.

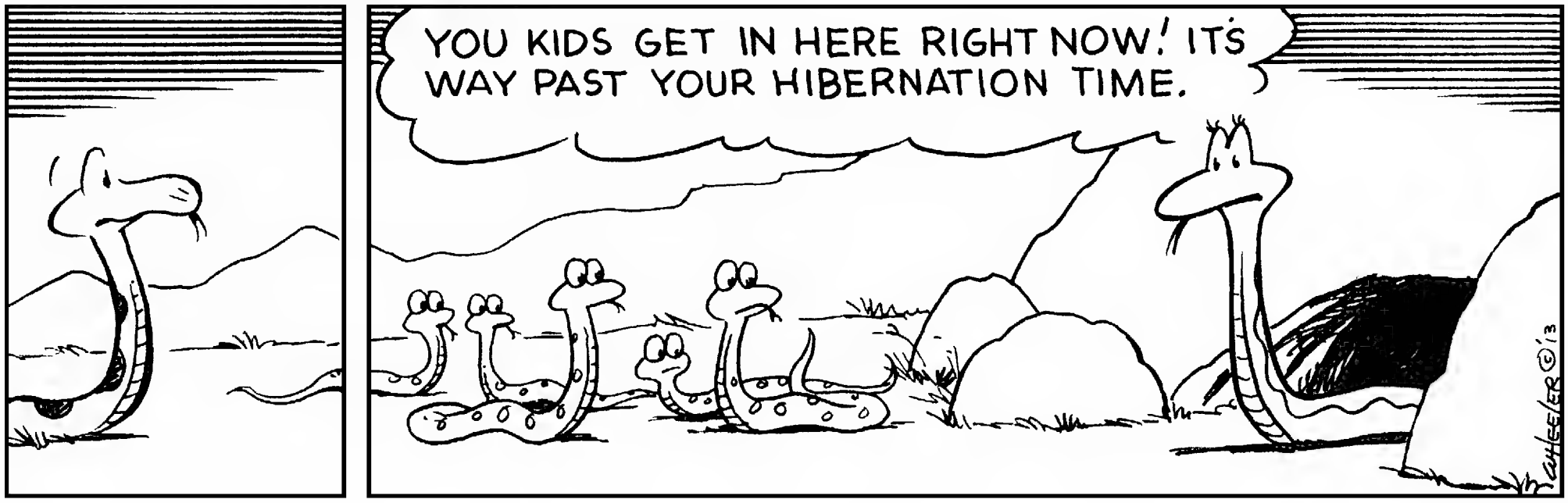
Board of Directors Meeting

Are you interested in how the decisions are made that determine how the Chicago Herpetological Society runs? And would you like to have input into those decisions? If so, mark your calendar for the next board meeting, to be held at 7:30 P.M., February 15, in the adult meeting room on the second floor of the Schaumburg Township District Library, 130 S. Roselle Road, Schaumburg..

The Chicago Turtle Club

The monthly meetings of the Chicago Turtle Club are informal; questions, children and animals are welcome. Meetings normally take place at the North Park Village Nature Center, 5801 N. Pulaski, in Chicago. Parking is free. For more info visit the group's Facebook page.

THE ADVENTURES OF SPOT



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BULLETIN
of the
Chicago Herpetological Society

Volume 48, Number 2
February 2013

BULLETIN OF THE CHICAGO HERPETOLOGICAL SOCIETY
Volume 48, Number 2
Febuary 2013

Notes on Mexican Herpetofauna 19: Herpetofauna Sympatric with *Gerrhonotus parvus* in San Isidro Canyon, Santiago, Nuevo León, Mexico . . . . . Javier Banda-Leal, David Lazcano and Manuel Nevárez-de los Reyes 13

The Measure of Experience . . . . . David G. Barker and Tracy M. Barker 20

Frog City: II. A Trying Guest Arrives Unannounced . . . . . Ilene Sievert 22

What You Missed at the January Meeting . . . . . John Archer 24

Herpetology 2013 26

The Tympanum . . . . . Curt L. Harbsmeier 29

Unofficial Minutes of the CHS Board Meeting, January 18, 2013 30

Advertisements 31

News and Announcements: 2013 CHS Grant Recipients 32

Cover: Black-tailed rattlesnake, *Crotalus cf. molossus*, San Isidro Canyon, Santiago, Nuevo León, Mexico. Photograph by Javier Banda-Leal.

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Notes on Mexican Herpetofauna 19: Herpetofauna Sympatric with *Gerrhonotus parvus* in San Isidro Canyon, Santiago, Nuevo León, Mexico

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Abstract

Gerrhonotus parvus is a species endemic to the state Nuevo León, presently known from only three localities in the Sierra Madre Oriental, one of which is San Isidro Canyon, located in the municipality of Santiago, where they have been frequently reported. The objective of this research was to investigate the herpetological species richness that coexists with *Gerrhonotus parvus*. We conducted a literature review that documented the herpetofaunal species in the municipality of Santiago, Nuevo León, together with several visits to the sites beginning in 1999 by personnel of the Herpetological Laboratory, Facultad de Ciencias Biológicas /UANL and a few North American herpetologists. We obtained a total of 43 species. It is worth mentioning that even though it is a relatively small area, it presents a high diversity in comparison with the rest of the state.

Resumen

Gerrhonotus parvus es una especie endémica del estado de Nuevo León, se conoce únicamente en tres localidades de la Sierra Madre Oriental, el cañón de San Isidro en Santiago Nuevo León es el área de donde se han reportado más ejemplares. La intención de este trabajo es dar a conocer la riqueza de especies de anfibios y reptiles que coexisten con *Gerrhonotus parvus* en esta zona, se realizo una revisión de literatura sobre trabajos realizados con la herpetofauna en el municipio de Santiago Nuevo León, así como de las visitas que se han realizado desde el año de 1999 por parte del personal del Laboratorio de Herpetología, Facultad de Ciencias Biológicas/UANL y muchos herpetólogos North Americanos. Esto nos llevo a un total de 43 especies. Cabe mencionar que a pesar de ser un área relativamente pequeña, presenta una alta diversidad en comparación con el resto del estado.

Introduction

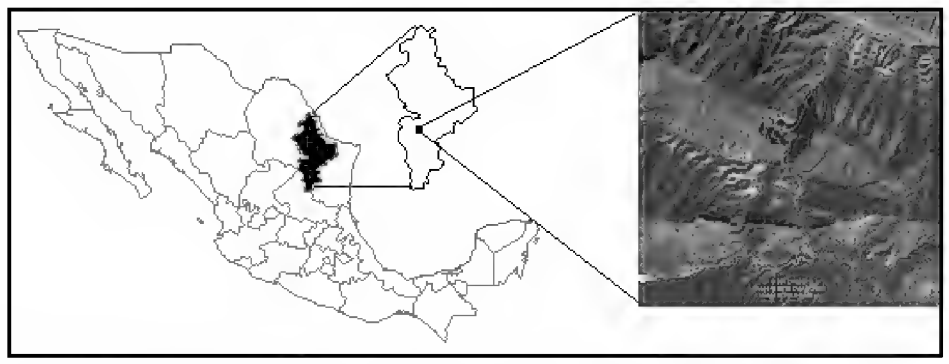
The family Anguidae comprises four subfamilies: Anguinae, Anniellinae, Diploglossinae and Gerrhonotinae. Its distribution is irregular in Europe; anguids also inhabit southern Asia and the Americas. This family is characterized by the presence of large body scales with minimal overlap. In addition there is a presence of adjacent osteoderms on the dorsal and ventral section that in most of the anguids are separated by a well defined deep granular ventrolateral fold. Two genera of the subfamily Anguinae and the members of Anniellinae lack limbs. In Gerrhonotinae and Diploglossinae the bodies are elongated and the limbs are reduced (Pianka and Vitt, 2003; Zug et al., 2001).

Anguids in Mexico are very diverse and include *Anniella* (2 species), *Barisia* (7 species), *Diploglossus* (3 species), *Elgaria* (7 species), *Gerrhonotus* (6 species, with a new species recently described by Bryson and Graham [2010]), *Mesaspis* (5 species), *Ophisaurus* (2 species) in the checklist of Liner and Casas-Andreu (2008). Many of these Mexican anguids are ecologically poorly known. In Nuevo León there are three species: *Barisia ciliaris*, *Gerrhonotus infernalis* and *Gerrhonotus parvus*. At some Nuevo León localities all three are sympatric, including San Isidro Canyon in the municipality of Santiago.

This group of species exhibits two foraging modes: active foraging (Vitt and Pianka, 1994), and "ambush," "sit-and-wait" or "passive foraging" (waiting for prey to come close—within the visual field) (Pianka, 1966; Vitt and Price, 1982). Anguids are often characterized as active foragers, even though the behavior has been documented from only a few species of this family (Bryson et al., 2003; Vitt and Congdon, 1978). We are actively studying anguid behavior in the field and laboratory.

Study Site

The Sierra Madre Oriental is a mountain range which contains numerous valleys and mountains that present widely varying climatic conditions as well as vegetation types. San Isidro Canyon is located in what is known as the Curvature of Monterrey within the Protected Natural Area known as Parque Cumbres de Monterrey, Nuevo León, in the municipality of Santiago. This canyon is located southwest of the municipality and is contiguous to the south with the state of Coahuila. The canyon is approximately 2 km in length, at an elevation of 1600 m with numerous rock walls that are about 400 m in height. It is consti-



Study site area: San Isidro Canyon, Santiago, Nuevo León, Mexico.

tuted of limestone, and the walls have elements of desert *rosetófila* vegetation: *Agave lecheguilla* (lechuguilla), *Agave bracteosa* (squid agave), and *Dasylirium* sp. (sotol). The canyon floor mainly contains submontane elements such as: *Helietta parvifolia* (barreta), *Chilopsis linearis* (desert willow), *Cercis canadensis* (eastern redbud), *Gochnatia hypoleuca* (shrubby bullseye), *Acacia rigidula* (blackbrush acacia), *Acacia farnesiana* (sweet acacia), *Acacia berlandieri* (Berlandier's acacia) and several oak species *Quercus* sp.. There is a gallery forest with a distinguishing element, *Platanus occidentalis* (American sycamore), throughout the canyon. There is almost always water flowing, but in the dry season the water flow may be intermittent. In branch canyons small pools may form. We have found several of our specimens, including a neonate, in these branch canyons.

Materials and Methods

The list of herpetofauna sympatric with *Gerrhonotus parvus* was based on literature records for the municipality of Santiago, Nuevo León, as well as visits to the area. Since 1999 the authors, from the Laboratory of Herpetology of the Faculty of Biological Sciences of the UANL, and other herpetologists, mainly North American, have visited the canyon about four or five times per year, monitoring species of the area. It is illegal to collect animals in the canyon without a scientific permit issued by our Mexican federal authorities.

Results

During these field trips we found several pygmy alligator lizards. They were found under dead plant matter and in crevices or active on the canyon floor close to the walls.

A small number of publications (13) were found that deal with the herpetofauna of the area:

• Treviño (1978) studied the distribution of herpetofauna in southern Nuevo León and reported several species present in San Isidro Canyon, although he did not collect in the canyon itself, but in nearby areas. The information is part of his bachelor's thesis.

• Bezy (1984) carried out a study on the systematics of the genus *Lepidophyma* in the northeast of Mexico, in which he reports various specimens for the municipality of Santiago, one in the area of Presa la Boca, (one of the superficial water supplies for the Monterrey metropolitan area), the others from Las Adjuntas in Parque Nacional Cumbres de Monterrey, approximately 19 km in a straight line from San Isidro Canyon.

• Smith (1986) proposed a taxonomic change of *Gerrhonotus parvus* to *Elgaria parva* based on similarity of the scalation of the head with this genus.

• Benavides-Ruiz (1987) compiled a list of the herpetofauna of the southern part of the municipality of Santiago. From one of her localities near the Sierra of San Isidro, she reports species also present in San Isidro Canyon. She did not find *Gerrhonotus parvus*. The information is part of her bachelor's thesis.

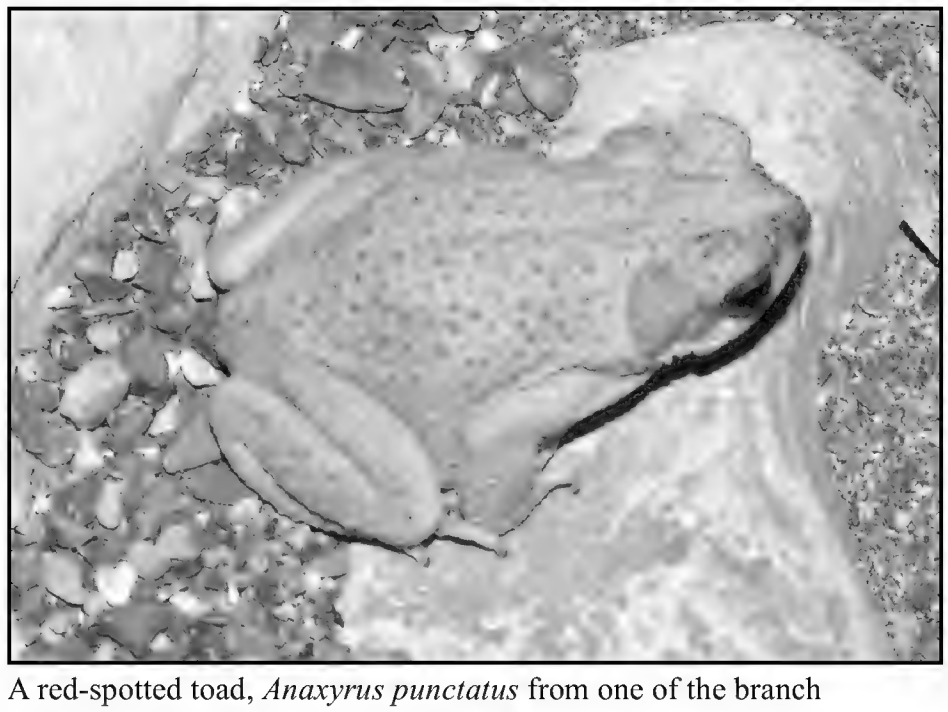
• Wiens et al. (1999) reviewed the taxonomic status of populations of the *Sceloporus jarrovii* complex and assigned the populations from northeastern Mexico to two species, *Sceloporus minor* and *Sceloporus oberon*. Using some specimens from Laguna de Sanchez and San Isidro, they assigned *Sceloporus oberon* to the area.

• Banda-Leal (2002) conducted a herpetofaunal study of Parque Ecológico de Chipinque in which he reports most of the species known from San Isidro Canyon, with exception of *Gerrhonotus parvus*. The information is part of his bachelor's thesis.

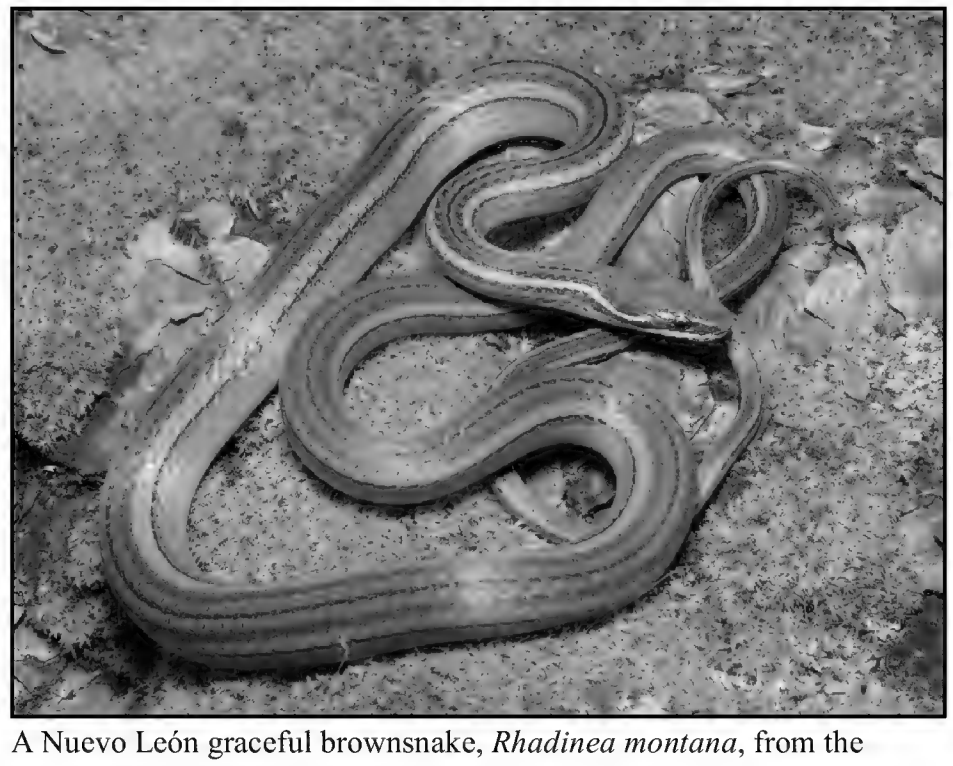
• Banda-Leal et al. (2002) documented a new locality for *Gerrhonotus parvus* (as *Elgaria parva*) in San Isidro Canyon. They discussed the morphology and taxonomic rank of the species and provided a description of the habitat that differs

Floor of the one of the branch canyons. Photograph by Javier Banda-Leal.

Pools of water sometimes form in the branch canyons. Photograph by Javier Banda-Leal.



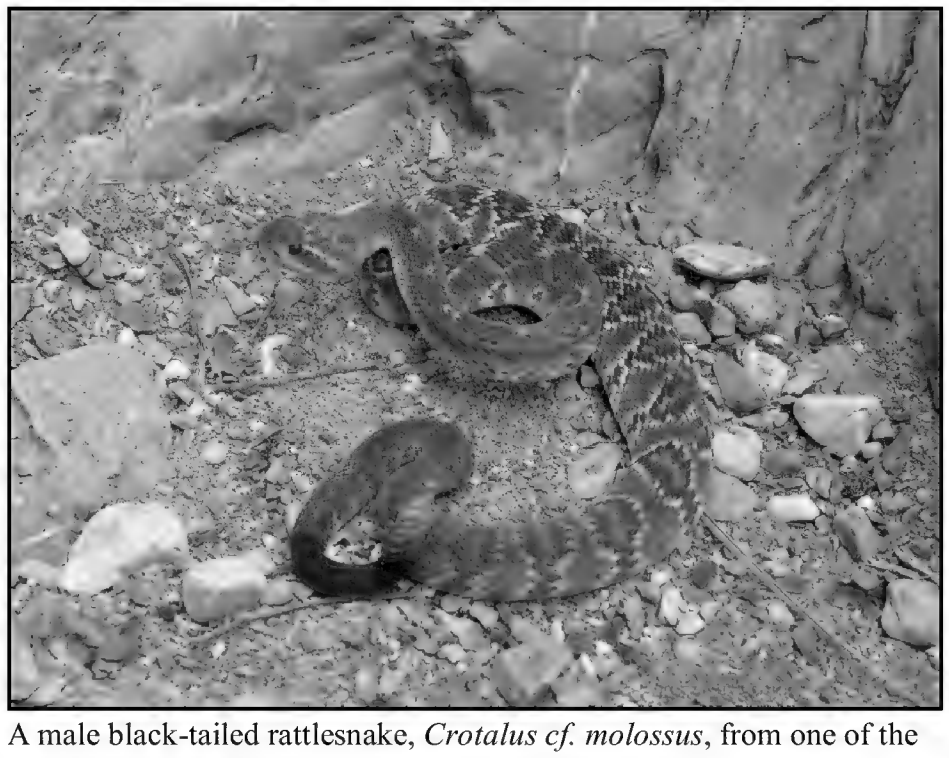
A red-spotted toad, *Anaxyrus punctatus* from one of the branch canyons. Photograph bt Javier Banda-Leal.



A Nuevo León graceful brownsnake, *Rhadinea montana*, from the canyon. Photograph by Robert Hansen.

A marked male pygmy alligator lizard, *Gerrhonotus parvus,* from one of the branch canyons. Photograph by Javier Banda-Leal.

A male Couch's spiny lizard, *Sceloporus couchii*. Photograph by Javier Banda-Leal.



A male black-tailed rattlesnake, *Crotalus cf. molossus*, from one of the branch canyons. Photograph by Javier Banda-Leal.

A juvenile *Sceloporus oberon*. Photograph by Javier Banda-Leal.

significantly from the type locality in Galeana, Nuevo León. San Isidro is a limestone canyon at an elevation of 1600 m. The specimen was found on the floor of the canyon beside a wall, with decomposing organic matter as a substrate.

• Bryson et al. (2003) documented several natural history aspects of *Gerrhonotus parvus* at the type locality and at San Isidro Canyon, along with some sympatric herpetological species in both areas.

• Banda et al. (2005) documented the largest known specimen of *Gerrhonotus parvus*, which was from San Isidro Canyon. The specimen, which had a complete tail, measured 76.5 mm in total length, exceeding the next largest known by 4.4 mm. This large specimen was found in the month of May at the base of a branch canyon, at a time when the branch canyon was flooded. The specimen unfortunately had died, apparently drowned. Lizards in the branch canyons are at risk due to flooding and the formation of deep ponds. Before this a paratype from Galeana was the largest specimen reported (Knight and Scudday, 1985). It was maintained in captivity for about 5 years and was deposited in the collection at the Sull Ross University.

• Conroy et al. (2005) used Bayesian analysis of DNA sequences to determine the phylogenetic position of *Elgaria parva*, locating it as the sister species to *Gerrhonotus infernalis*. Thus, they proposed placing it in the genus *Gerrhonotus* (rather than *Elgaria* as originally described by Knight and Scudday [1985]).

• Lazcano and Bryson (2010) registered a young *Gerrhonotus parvus* for the first time, from San Isidro Canyon. The specimen described had a complete tail and its coloration was very different from the adults, consisting of sharply defined dark bands. Although the adults also have bands, they are not so dark and do not contrast sharply with the ground color. The young are very different from those of the sympatric *Gerrhonotus infernalis*, which are very similar to adults of the species.

• Dixon et al. (2011) reviewed three species of *Rhadinaea* found in the Sierra Madre Oriental of Mexico, including specimens of *Rhadinaea montana* from the mountains of Santiago, Nuevo León, and San Isidro Canyon, sympatric with *Gerrhonotus parvus*.

• Narváez-Torres (2012) conducted a study of the herpetofaunal composition of the natural protected area Parque Nacional Cumbres de Monterrey which included San Isidro Canyon. He did not find the endemic species *Gerrhonotus parvus*.

We have found a number of species sympatric to the pygmy alligator lizard in San Isidro Canyon: *Anaxyrus punctatus* (red-spotted toad); *Ollotis nebulifer* (Gulf Coast toad); *Eleutherodactylus cystignathoides campi* (Rio Grande chirping frog); *Eleutherodactylus longipes* (long-footed chirping frog); *Ecnomiohyla miotympanum* (small-eared treefrog; *Smilisca baudinii* (Mexican treefrog); *Scaphiopus couchii* (Couch`s spadefoot); *Gerrhonotus infernalis* (Texas alligator lizard) which has a wide distribution in Texas and northern Mexico; *Sceloporus couchii* (Couch's spiny lizard); *Sceloporus grammicus disparilis* (northeastern graphic lizard); *Sceloporus oberon* (royal lesser minor lizard); *Sceloporus parvus* (northern blue-bellied lizard); *Sceloporus torquatus binocularis* (Nuevo León torquate lizard); *Plestiodon brevirostris pineus* (pine woods short-nosed skink); *Scincella silvicola caudaequinae* (Horsetail Falls ground skink); *Aspidocelis scalaris gularis* (Texas spotted whiptail); *Coluber constrictor oaxaca* (Mexican racer); *Coluber schotti ruthveni* (Ruthven's whipsnake); *Coluber flagellum testaceus* (western coachwhip); *Lampropeltis mexicana mexicana* (San Luis Potosí kingsnake); *Pantherophis bairdi* (Baird's ratsnake); *Pituophis deppei jani* (northern Mexican pinesnake); *Rhinocheilus lecontei* (long-nosed snake); *Rhadinaea montana* (Nuevo León graceful brown snake); *Salvadora grahamiae lineata* (Texas patch-nosed snake); *Thamnophis proximus diabolicus* (arid land ribbonsnake); *Crotalus atrox* (western diamondback rattlesnake); *Crotalus cf. molossus* (black-tailed rattlesnake) and *Crotalus lepidus lepidus* (mottled rock rattlesnake).

Collected specimens were identified using criteria established by Smith and Taylor (1945, 1948, 1950), Conant and Collins (1998), and the *Catalogue of American Reptiles and Amphibians*. The phrynosomatids we collected were identified using keys for species from Nuevo León and Tamaulipas constructed by Hobart Smith. Scientific and common names were updated using Liner and Casas-Andreu (2008).

Discussion and Conclusions

The herpetological richness of the state of Nuevo León accounts for a total of ~136 species (110 reptiles and 26 amphibians). The 44 species (37 reptiles and 7 amphibians) on our list for San Isidro Canyon (see Table 1) represent 32.35% of the total herpetofauna of the state.

Some of these species on the list are potential predators of *Gerrhonotus parvus*. For example, we found a rock rattlesnake that had predated a juvenile *Sceloporus oberon* on the road in San Isidro Canyon toward Laguna de Sanchez (Lazcano et al., 2004). And as *Gerrhonotus infernalis* is a sympatric species and very aggressive it could easily predate the much smaller *G. parvus*.

With more field trips the herpetological list could grow easily. This is an excellent place to do continual monitoring of amphibians and reptiles. At the moment we have a doctoral degree thesis project underway on the ecology and phylogeny of the species in the canyon.

Alamo Canyon, a parallel canyon to San Isidro, has not been explored herpetologically. Access to Alamo Canyon is by dirt road, not paved like San Isidro. No doubt *Gerrhonotus parvus* and many of the sympatric species are there.

Acknowledgments

We would like to thank the multiple national and international institutions that supplied their collection data for this specific area, allowing us to update the herpetofauna for the Sierras of Nuevo León; the Universidad Autónoma de Nuevo León, for financial support of this study; the SEMARNAT for issuing collecting permits and providing the most recent ones: Oficio Num. SGPA/DGVS/0511/12 and Oficio Num. SGPA/DGVS/07101/12. We would also like to thank all the persons who participated in lab and field work, in particular Dr. James R. Dixon, Dr. Robert W. Bryson, Jr., and Dr. Robert L. Bezy for going over the manuscript and the authorities of Parque Nacional Cumbres de Monterrey.

Table 1. Amphibian and reptile species from the area of San Isidro Canyon, based on literature reports and specimens in preserved collections. Status = protection status in the Mexican NOM-059-SEMARNAT-2010: A = *Amenazada* (Threatened); Pr = *Protección Especial* (Special Protection); SE = *Sin Estatus* (No Status). Observed = species seen during the course of this study. Common and scientific names follow Liner and Casas-Andreu (2008).

Taxon	Common Name	Status	Observed
Amphibia: Anura			
Family Bufonidae			
(1) *Anaxyrus punctatus* (Baird and Girard, 1852)	Red-spotted Toad	SE	X
(2) *Ollotis nebulifer* (Girard, 1854)	Gulf Coast Toad	SE	X
Family Eleutherodactylidae			
(3) *Eleutherodactylus cystignathoides campi* (Stejneger, 1915)	Spotted Chirping Frog	SE	X
(4) *Eleutherodactylus longipes* (Baird, *in* Emory, 1869)	Long-footed Chirping Frog	SE	X
Family Hylidae			
(5) *Ecnomiohyla miotympanum* (Cope, 1863)	Small-eared Treefrog	SE	X
(6) *Smilisca baudinii* (A. M. C. Duméril and Bibron, 1841)	Mexican Treefrog	SE	X
Family Scaphiopodidae			
(7) *Scaphiopus couchii* Baird, 1854	Couch`s Spadefoot	SE	X
Reptilia: Squamata—Lizards			
Family Anguidae			
(8) *Barisia ciliaris* (H. M. Smith, 1942)	Northern Alligator Lizard	Pr	X
(9) *Gerrhonotus infernalis* Baird, 1859 (1858)	Texas Alligator Lizard	SE	X
(10) *Gerrhonotus parvus* Knight and Scudday, 1985	Pigmy Alligator Lizard	Pr	X
Family Phrynosomatidae			
(11) *Sceloporus couchii* Baird, 1859 (1858)	Couch's Spiny Lizard	SE	X
(12) *Sceloporus grammicus disparilis* Stejneger, 1916	Northeastern Graphic Lizard	Pr	X
(13) *Sceloporus oberon* H. M. Smith and B. C. Brown, 1941	Royal Lesser Minor Lizard	SE	X
(14) *Sceloporus parvus* H. M. Smith, 1934	Northern Blue-bellied Lizard	SE	X
(15) *Sceloporus torquatus binocularis* Dunn, 1936	Nuevo Leon Torquate Lizard	SE	X
Family Scincidae			
(16) *Plestiodon brevirostris pineus* (R. W. Axtell, 1960)	Pine Woods Short-nose Skink	SE	X
(17) *Scincella silvicola caudaequinae* (H. M. Smith, 1950)	Horsetail Falls Ground Skink	A	X
Family Teiidae			
(18) *Aspidocelis scalaris gularis* (Baird and Girard, 1852)	Texas Spotted Whiptail	SE	X
Family Xantusiidae			
(19) *Lepidophyma sylvaticum* E. H.Taylor, 1939	Madrean Tropical Night Lizard	Pr	
Reptilia: Squamata—Snakes			
Family Colubridae			
(20) *Coluber constrictor oaxaca* (Jan, 1863)	Mexican Racer	A	X
(21) *Coluber flagellum testaceus* Say, *in* James, 1823	Western Coachwhip	A	X
(22) *Coluber schotti ruthveni* (Ortenburger,1923)	Ruthven's Whipsnake	SE	X
(23) *Drymarchon melanurus erebennus* (Cope,1860)	Texas Indigo Snake	SE	
(24) *Drymobius margaritiferus margaritiferus* (Schlegel, 1837)	Northern Speckled Racer	SE	
(25) *Hypsiglena jani texana* Stejneger,1893	Texas Nightsnake	Pr	
(26) *Lampropeltis mexicana mexicana* (Garman, 1884 [1883])	San Luis Potosí Kingsnake	A	X
(27) *Leptodeira septentrionalis* (Kennicott, *in* Baird, 1859)	Northern Cat-eyed Snake	SE	
(28) *Opheodrys aestivus majalis* (Baird and Girard, 1853)	Western Rough Greensnake	SE	
(29) *Pantherophis bairdi* (Yarrow, *in* Cope, 1880)	Baird's Ratsnake	SE	X
(30) *Pituophis deppei jani* (Cope, 1861 [1860])	Northern Mexican Pinesnake	A	X
(31) *Rhadinaea montana* H. M. Smith, 1944	Nuevo Leon Graceful Brown Snake	Pr	X
(32) *Rhinocheilus lecontei* Baird and Girard, 1853	Long-nosed Snake	SE	X

Table 1 (cont'd).

Taxon	Common Name	Status	Observed
(33) *Salvadora grahamiae lineata* Schmidt, 1940	Texas Patch-nosed Snake	SE	X
(34) *Senticolis triaspis intermedia* (Boettger, 1883)	Northern Green Ratsnake	SE	
(35) *Storeria hidalgoensis* E. H. Taylor, 1942	Mexican Yellow-bellied Brownsnake	SE	
(36) *Tantilla rubra* Cope, 1876 (1875)	Red Black-headed Snake	Pr	
(37) *Thamnophis cyrtopsis cyrtopsis* (Kennicott, 1860)	Western Black-necked Gartersnake	SE	
(38) *Thamnophis proximus diabolicus* Rossman, 1963	Arid Land Ribbonsnake	A	X
(39) *Trimorphodon tau tau* Cope, 1870	Mexican Lyresnake	SE	
(40) *Tropidodipsas sartorii sartorii* Cope,1863	Sartori`s Snail Sucker	Pr	
Family Crotalidae			
(41) *Crotalus atrox* Baird and Girard, 1853	Western Diamondback Rattlesnake	Pr	X
(42) *Crotalus lepidus lepidus* (Kennicott, 1861)	Mottled Rock Rattlesnake	Pr	X
(43) *Crotalus cf. molossus*	Black-tailed Rattlesnake	Pr	X
Family Elapidae			
(44) *Micrurus tener* (Baird and Girard, 1853)	Texas Coral Snake	Pr	

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The Measure of Experience

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Growing up as snake lovers some decades ago, we and our fellow snake fanatics knew who the experts were. They were the few people with whom we had any sort of contact who had experience. Now this was not a large number of people. Even counting the authors of the few reptile books that we managed to find in the library, there weren't many experts.

"Experience" to us meant access to snakes. You couldn't get experience if you didn't have snakes. But it wasn't easy to get snakes back then. Even local snakes were a challenge to acquire. There were no publications in our local libraries that detailed how to collect snakes.

Of course, in those days, as in many places today, the local people were convinced that snakes were everywhere. When asked, they would just sort of point to the brushiest spot and wave a hand and declare that "right over there is full of them!" Sadly, we never found that place to which they referred.

Not that many years ago, the pursuit of a snake hobby was a rather isolating lifestyle. In some extreme cases it actually produced hermits, people whose greatest fear was that their neighbors might find out what was in their basement. That wasn't because snake keeping was an illegal hobby back then. There were few city ordinances that specified forbidden sizes or species within municipal boundaries. No, the reason was that snake keepers didn't want everyone in the neighborhood to think they were odd.

It was lonely back then for most of us.

There were no color glossy magazines. There was no classified advertising for reptiles. Most of us growing up in small-town America didn't have access to, much less membership in, regional herpetological societies. There were no weekend snake sales. There were precious few books, and there were hardly any pictures in the few books that we could find in public libraries. It was rare that any pet store would have a snake on display. We couldn't have even imagined the possibility that someday there would be an Internet with reptile sites that pulled in tens of thousands of visitors every month.

This wasn't very long ago.

Of course, back then there existed many wholesale animal businesses that annually imported hundreds of thousands of snakes, other reptiles, mammals, and birds into the U.S. Most of these importers were in Florida, although they existed also in New York and Philadelphia, Texas and California. But these businesses mostly supplied the pet stores in the largest cities, and very few imports trickled out to the mom-and-pop pet shops in Middle America. These reptile wholesalers mailed out monthly price lists featuring items like "boa constrictors at $4.00/foot" or "horny toads for $0.60 each." But we never even suspected they existed because what also existed then were *secrets*.

As hard as this may be to believe, snake people actually kept snake secrets from other snake people. When we were starting out, the few herpers we knew and the few pet stores we haunted would never have considered giving us access to the names and addresses of reptile importers or wholesale businesses. For that matter, most snake keepers wouldn't divulge the maintenance and breeding secrets that they had independently discovered. There were lots of secrets that we the underlings would have to strive to uncover for ourselves.

Today, however, secrets are hard to keep, the snake business has changed, and most keepers have easy access to an incredible variety of snakes.

Now, entering the second decade of the 21st century, an overwhelming amount of information about reptiles is published and readily available. Young keepers can't comprehend what a recent turn of events this is. There are now so many books, magazines, newsletters and websites that it would be nearly impossible to read and absorb all the existing information about snakes. And this is the problem. With so many authors promoted as "experts," how in the world can young keepers know who the real experts are? In whose information should they place their trust?

It's our observation that a new class of "experts" has proliferated, one comprised mostly of well-read, snake-loving people with strong interests and a few snakes. Some of these would-be experts have read and memorized every printed word written about some particular species. They are veritable walking encyclopedias—but with only one or two entries. We have met people who can quote passages from some of the old articles we wrote for *Vivarium* magazine as if they were Scripture.

And, of course, contributing to the creation of this new class of experts is the realization by publishers that snake books sell, and snake magazines sell. There are publishers who comb herpetoculture looking for wanna-be authors, people willing to write on some subject that the market research team at the publishing house has decided will sell. The result has been a flood of publications that, frankly, aren't worth a damn.

Much of what has been written in the past 20 years or so was authored by people with insignificant amounts of experience with the particular animals that were the topics. Then these manuscripts were edited by people with no clue about herpetoculture. They rehash and reinterpret older published information, and all too often they repeat misinformation handed down to us from previous generations who were writing when herpetoculture was so young that it was diapered by Ditmars. Much of what is published on the general topic of herpetoculture today can be described only as poor and not founded in significant experience.

So who are the true experts and how do we identify them? The experts of herpetoculture today are the people with extensive experience with animals, the same as when we were growing up. Herpetoculture is a hands-on activity, not a cerebral exercise. To develop expertise requires time and it requires

hand-on experience. There is no substitute.

For this reason, we propose an actual measure of experience: the "snake-year." A keeper achieves one snake-year of experience by maintaining one snake for one full year. If a keeper keeps ten snakes for ten years, he or she then has accumulated 100 snake-years of experience. Of course, for lizard people there is the "lizard-year," and turtle people have "turtle-years." The snake year is a quantitative measure of experience. It is a means by which a keeper can personally measure his lifetime experience, evaluate the experience of other keepers, and measure the merit of information and advice presented by the tidal wave of pseudoexperts with which we recently have been deluged.

This type of measurement is used by falconers as a gauge of devotion and expertise. For those of you who have not been exposed to falconers, they are the only other group of animal people who just might possibly love their animals with a passion equal to that encountered in the snake world. There are different recognized degrees of falconry based on experience, all the way up to lofty Master Falconer. Different federal falconry permits are required for each level, each granting access to different falcons, hawks, and eagles. For example, a beginning falconer cannot keep a peregrine falcon or gyrfalcon. Perhaps a beginning snake keeper should not keep a reticulated python or spitting cobra.

Of course, it's possible that someone with a lot of snake-years may have learned little, done a miserable job as a keeper, and killed multitudes of snakes. Certainly there are animal importers who have had thousands of full cages of reptiles for dozens of years; most of these people are truly experts at what they do, but there have been a few that were grossly incompetent, able to stay in the business only because of the short time they maintained any animal. In the animal business in general, if people continue working with animals, they gain experience and eventually gain expertise.

Today there are giants of herpetoculture living among us, many of whom are unrecognized by most keepers. These are people with whom one can spend an afternoon talking at a snake show where they are sitting behind their tables. These are the keepers with thousands of snake-years, a degree of experience that in the future may never be equaled. An amazing number of these people are modest snake folk who remain quiet in a crowd while some 15-year-old "expert" with only three snake-years loudly pontificates about how to keep ball pythons or spotted pythons.

Consider, there may be herpetological prodigies, but there are no young herpetocultural experts.

How much experience is a lot of experience? Well, there are quite a number of keepers with 1,000 snake-years, obtained by keeping 100 snakes for 10 years or 50 snakes for 20 years. Even 500 snake-years of experience amounts to a very respectable career with snakes, certainly qualifying one as an expert. Today there are several dozen active keepers with more than 5,000 snake-years of experience. And there are a few keepers among us with more than 10,000 snake-years of experience, some of whom are still keeping snakes!

Unfortunately, many of herpetoculture's greatest experts have not documented their hard-accumulated wealth of knowledge. Some of them are already dead, and many of the rest will disappear almost without a trace. But while they may receive little notice or credit from future generations of snake keepers for the collective body of knowledge generated by their experience, they will have contributed. They will leave behind to the current generation their conversations on the telephone, their shop talk around the beer kegs, their input to panel discussions at annual herpetological meetings, their discussions across the table at weekend reptile shows. Some of their stories may become part of the myth and lore of our world. They will leave behind their trainees and interns who cleaned cages for the fun of it, the kids they have inspired, and in some cases, the keepers they directly taught to keep snakes. In herpetoculture, we build on the experience of the experts who came before us. Just by doing what they love to do, they will have contributed.

We snake people need to be more aware of the varying levels of experience around us in the snake world. Experience does count. Often it makes the difference between life and death, both for the keeper and the kept. It only takes a lot of money to amass a large collection of snakes, but it takes devotion and expertise to keep a large collection of snakes for years. Perhaps it is time that herpetoculture follow the example of falconry. It's easiest for the government to take away everyone's right to maintain venomous and large snake species if we keepers have no bona fide, recognized experts, and if we have no level of Master Snake Keeper to which young keepers can aspire.

Today some of the greatest experts of herpetoculture are living among us, many of them still off in their little worlds cleaning cages. We need to acknowledge their devotion and experience. We need to acknowledge the unit of a snake-year as a valid and necessary means to measure experience and, by extension, expertise. We need to know our experts.

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In fond remembrance of Ilene Sievert, who died December 16, 2012, this year we will reprint several of the essays that Ilene wrote for these pages between 1988 and 1993 under the rubric "Frog City." This one is from July 1988.

Frog City
by Ilene Sievert

II. A Trying Guest Arrives Unannounced

Last September, in the season when nights are cool but days still mellow, and gardens are old and rich and ready for an active retirement before senility and death (and who can say in which hour they will strike), the cleaning woman came lugging a large bucket. She brought it, she said, "because I know you love turtles." At the bottom of the bucket, in a few inches of water, was a large greenish disk. Eva had been fishing in a lake in southern Indiana and the turtle had hooked himself on her worm-baited line. She took it back to the apartment in Chicago and her daughters had amused themselves with it, and fed it worms, she said, and now she brought it to me. I could guess why.

The object in the bucket looked like an olive drab pita bread, about six and one half inches in diameter, and rimmed in creamy yellow. A black line was hand drawn with an ink brush just inside the circumference. The same brush had drawn black o's in the middle diminishing to small dots and dashes near the edge. A real, live, softshell.

Firsthand observation of softshells had been limited to some juveniles at CHS meetings and a distant view of snorkels and beady eyes in Florida waters. There were overheard conversations on how mean-tempered they are, how long the neck and sharp the jaw, how very aquatic, so that tissues absorbed oxygen directly from the water to supplement air breathing; also that they are best kept alone, other turtles might injure them, that they like to burrow into the bottom, covering their backs with mud or sand, sticking out their long-necked heads to grab prey or breathe.

I did know personally, in all verity, that adult aquatic turtles take a big tank and are very dirty.

"I'll want my bucket back," Eva said.

I asked if there were any more fishing trips to Indiana this year. Alas, no.

In the yard is a long galvanized tub partly full of water, and containing a clay drain tile propped with heavy bricks. On sunny days we brought out a juvenile wood turtle to stretch his legs, get sun, and improve his mind with new experience. The tile was a cool shelter. (An outdoor tub is a good place to feed minnows because the stinky remains can be easily hosed away.) Woodie was always taken in before evening for fear of raccoons. Raccoons had mauled an adult painted turtle left out one summer night and left her bleeding on the lawn. Nevertheless, that big softshell could not go in a ten-gallon tank, the only other accommodation with immediate occupancy. So, we carried the bucket and contents over to the tub. When I picked up the disk the back was rough as sandpaper but the underside was unexpectedly slick and slippery. Legs and head jerked out and the turtle flew into the tub, apparently unhurt, and glared up at me from a weird little snorkel-tipped head. Then he hid in the drain tile. Raccoons did not bother him.

There was a CHS meeting next evening, so I took him along (in my own bucket) for an inspection by the turtle-elders and to confirm identification as male eastern spiny softshell, *Trionyx spinifera*. One maven, my favorite patient maven, demonstrated the cleverest method for inspection of a turtle's jaw. First, annoy its head until it bites a finger and hangs on. Then, by moving the finger around, one can scrutinize parts of the mouth and jaw. When the turtle is tired it lets go. This simple but valuable idea can be extrapolated for other occasions of natural observation. (Perhaps one should take care not to exceed tissue tolerance of the experimenter. Even if the possessor of the finger, foot, head, or whatever is not the observer, screaming and writhing might obscure accurate data-taking.)

You may read about the great length of a softshell's neck. How more impressive to see it stretching around for a nip as it is held! Another maven taught me to hold it by the rear leg openings. You have to catch it first. Fortunately, although Snork feared and detested human contact he put more energy into flying than biting.

He spent several weeks in the outdoor tub and appeared to eat nothing. Hastily we caulked up an old 15-gallon tank, fitted it with a waterfall type filter, and brought Snork indoors. For one day he freaked out, rushing around trying to climb out of the tank. If it was too full of water he flew out. If a haul-out was provided he flew out. As he didn't, contrary to appearance, sail like a frisbee, the tank was kept on the floor. Then he settled into a state of inactivity. He remained near the bottom, rarely sticking up his snorkel and pulsing his neck under the fast flowing current of falling water. He ate nothing. After a month of this I consulted a turtle-elder about the problem. We discussed water temperature. The unheated water was the temperature of the air in the house, about 68–72°F. Warm it up to mid 80s was the suggestion. How strange it seems in winter, to heat up a temperate climate wild animal to a degree uncomfortable to me! True, if I were naked and wet 84 would be more comfortable than 68. Yet, it's doubtful the rise in temperature would stimulate my appetite for worms so perhaps the analogy doesn't hold. Has anyone tried putting little wool sweaters on turtles? Imagine the collar!

By this time we had acquired a 20-gallon tank and gradually warmed it to 84°F. After a week of warm temperature the animal came alive. Now Snork could be observed swimming and feeding. He entranced us and every visitor with his weird beauty. The smooth crusted pita bread body appears slit at opposite sides, head and forelegs inserted in the front end, rear legs and

thick tail in back—a turtle sandwich. The streamlined small head has a slender tubular pig snout with two piggy holes in the end, light colored, flexible and probing. He stuck it into all the corners and walls of the tank, rubbing it along the glass till it glowed pink. The eyes are yellow, round, small and high, with an dark dot in the center. They shift rapidly back and forth, staring, nervous, apprehensive. A pair of double black stripes, filled with gold, lead back from the top of the snout through the eyes. The snaky neck is legendary for extending the snorkel to the surface, but my favorite neck maneuver is "periscope up," when the head angles to get the eyes above water without pointing the snout straight up. Then scan left, scan right, submerge. When the neck extends, the shell behind it hikes up like the stiff tapestry collar of a bishop's cope.

The front and back legs, all mottled in gold and black, are a mass of voluminous wrinkles and folds that unfurl as paddles, the rear legs especially wide when opened for hovering. No wonder he flies so well. Each leg is tipped by ivory claws that can be strongly deployed. In his short stay in the fifteen-gallon tank he scrabbled out all the inner bead of caulking. Gravel and sand had been put in as substrate, but it was so hurled about the filters were ruined. The claws also give good purchase in human skin preparatory for flying take-off.

The tail, like the head, has a pair of double stripes. This male turtle has a special secret weirdness—an almost black copulatory organ, thick and half as long as he is, and shaped in a burst of ragged points at the end. He modestly would evert this organ from his tail only when he believed himself alone. If he caught sight of a voyeur it disappeared magically, the genie back into the bottle.

Even his plastron is strange, slippery as oiled teflon. It is translucent and blood vessels show through it.

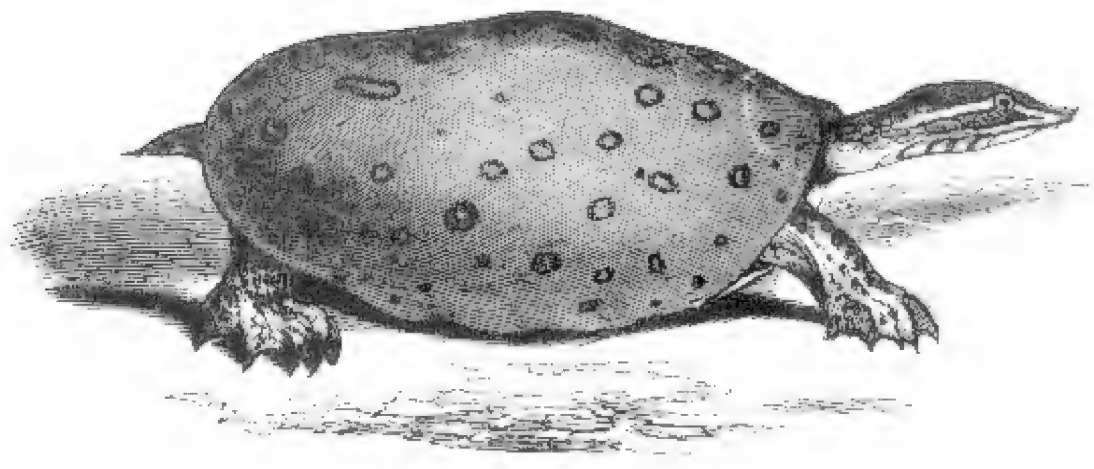
When he wishes he can pull in legs and head and tuck the tail sideways for the "disk look." A front view shows mottled wrinkles with a central circle of folds surrounding two snout holes.

Snork ate prodigiously of vitamin-fortified mealworms, minnows, and earthworms. He liked poultry liver and had turkey liver for Thanksgiving. He fouled his water, also prodigiously. Filtering was insufficient. We changed half the water once a week but the water grew cloudy and slimy. Even after complete changes it would cloud in one week. Unpleasant whitish circles appeared on his back, first faintly then more pronounced. Dark spots formed on the back of his neck and blackened rims on his feet. Worst of all, he tried desperately to fly out of his tank, something not done since the first hectic day indoors. It soon became obvious that the white circles were open sores. Dry him a while, I thought. Less than a day dry left him shriveled and miserable, so we tried shallow water with the back exposed. A water mark appeared with a shrivelled area where it had been dry. Enough - off to the vet to treat and correct whatever was wrong. Antibiotic was injected and applied. It seems this very aquatic turtle needs to bask. He always had a vitalite, but we never could figure out how to put a basking place in the tank without the flying turtle effect. We had to roll up sleeves, grab turtle, and put him in a separate dry tank lined with newspaper, for basking under a warm incandescent lamp (and vitalite too for good measure). After an hour he was hidden under the newspaper. We always set a timer to avoid cooking turtle en papillote. At first this was done daily, then every two–three days.

It also seems that softshells are very sensitive to pH of the water and my Evanston tapwater is too alkaline. Acidity and salt were gradually added using a husbandry information sheet and water testing kit. These adjustments must be redone with any water change, which schedule has been complete change, washed tank, once a month. Oh, those siphons, buckets, and puddles!

On this regime Snork now looks lovely, the sore and black areas healed (with lots of sloughing) and only a faint circular water line remains on his back. As a result of so much handling he is less wild and will eat when someone is looking. He'll even take a choice bit off the end of a forceps. It is still apparent, though, that he detests people and captivity—and this particular person detests his demanding health requirements. Snork will be repatriated through the CHS Bureau of Immigration, to a quiet lake where, one hopes, fishermen will not often tempt him. There he will be free of grabbing hands and prying eyes.

Meanwhile, Eva still cleans for us, so watch this space.



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What You Missed at the January Meeting

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Ray Pawley is a man who needs no introduction . . . unless you're young, not interested in herps, have no association with zoos in the last several decades, were not a member of the Chicago Herpetological Society at its genesis, have had no association with your society for several decades, have not attended any of the multiple meetings where he has been a guest speaker, or have not read any of the articles I kludged together about those meetings. So I'm going to introduce him again (reintroduce?) for the few of you out there that may fall under any of those categories. Not that I'm casting stones here. Well, it is a sin not to be reading my articles, but there are certainly very reasonable explanations why someone who is reading this might not know the name of Ray Pawley. Few of them, but they do exist.

Ray Pawley. Photograph by Dick Buchholz.

After years of keeper and curatorial work at Lincoln Park Zoo and Brookfield Zoo, Ray has now retired to New Mexico, but ties to this area still bring him to Chicago where we take advantage and have him disseminate some of the immense knowledge that he's acquired. Among all of his other accomplishments, he managed to be a force in the establishment of your society and served as president multiple times. Not that I'm trying to date Ray, but he was keeping reptiles and amphibians, along with mammals and birds, when little was known of husbandry for most animals. For a little while at February's meeting he allowed us a glimpse of some of the trials of those years and some of the lessons learned. In the aviation industry when a group of pilots sit around swapping stories they call it hangar flying. New pilots or even not-so-new pilots glean valuable information from those sessions. Ray gave us a little taste of hangar flying for those of us keeping herps. Much to my chagrin, I was unable to attend, but Josh Baity was nice enough to record the presentation and I am happy to give you an idea of what went on.

Ray began by claiming he might be the kiss of death for reptile houses, seeing as Lincoln Park Zoo has now closed the reptile house he worked in there, and soon after he retired from the Brookfield Zoo that reptile house also closed. To the laughter of his audience he refused to ever work for Rob Carmichael because, as the last reptile-concentrated facility in the area, he didn't want the Wildlife Discovery Center to close. He also said that he would stick to his notes or he would be talking until midnight.

He emphasized the greater flexibility that individuals have over zoo curators, who have to satisfy the demands of not only the animals, but also the public and the administration. The interaction of these three claimants often obstructed the best solutions, but Ray did the best he could with what he had. The Brookfield reptile house was designed in the 1920s when the state-of-the-art thinking was reptiles needed only a water bowl and the habitat was to be dry. By the '60s humidity was a major player in reptile husbandry and Ray talked of being stuck with a building that had inadequate heat, no air conditioning, no humidifier, and minimal electrical outlets. In the winter it was too cold and in the summer it was too hot. Ray remembers using cold packs for the animals as crowds of visitors toured the house with sweat dripping from their noses in the hundred-degree building.

Ray would admonish his staff never to surprise him. An administrator broke that rule when, after hearing that the reptile house needed humidity, had a humidifier installed without consulting Ray. Within two weeks the animals were developing skin blisters, the plaster walls were melting, and Ray was forced to combat the added humidity. Good intentions can have poor outcomes.

Ray's rule of thumb for what constitutes a good representation of reptile species involves about a hundred different species. In a house designed with only sixty exhibits, he had to experiment with multiple animals in the same cage. After poor results caging closely related species, they hit upon the successful tactic of housing unrelated species that needed the same habitat and wouldn't compete for the same resources. Combining turtles and snakes and other vastly different species allowed him to boost the number of species displayed to 120, covering all major orders of reptiles except the tuataras, which Ray claimed were not a particularly charismatic order anyway.

But making an appealing attraction for the public meant introducing more than just reptiles, and Ray introduced small mammals and birds to the reptile house. Marmosets would run along the guardrails, enough at home that they actually bred, and touracos would careen through the visitors as the African birds flew from one exhibit to another. And most of us who visited that reptile house remember what Ray said was the most popular exhibit, the Madagascar hissing cockroaches.

Brookfield's success at having long-lived animals across all species Ray attributes to his staff always listening to the animals. He pointed out that not everything written on care is accurate nor do the animals read the books. While literature research is important, it's more important to put egos aside, consult with keepers, pool opinions, and watch the animals. Setting up protocols is absolutely necessary, but Brookfield was constantly updating and changing procedures based on what was learned from the animals. A good lesson for those of us who are keepers, but Ray stressed that changes to actions that have worked in the past should be carried out conservatively.

In a zoo setting, Ray refrained from making the animals pets. Animals were encouraged to own their cages. Handling was kept to a minimum and was always negotiated with the animal. Rather than grabbing an animal to relocate it, a snake hook might be used to gently displace the animal while the cage was being cleaned, always with the goal of minimizing stress. Cage

furniture was always replaced in the same spot. And Ray made a case for not sterilizing everything in the cage, but allowing ordinary bacteria to aid the animals' immune responses and digestion. Clean is OK; sterile probably not needed and potentially harmful.

To illustrate his concept of listening to animals by attempting to understand how they perceive the world, Ray used the arrival of a seven-foot-long fer-de-lance (*Bothrops asper*). For a year the animal, while not appearing distressed, refused to eat. Ray, thinking of a snake's ability to receive infrasound and realizing that the hundreds of zoo visitors traipsing through the reptile house eight hours a day would certainly have an impact, put a sponge-rubber pad under the animal's favorite resting spot. The next day the snake ate. The snake lived for 17 years.

Ray also highlighted that many husbandry solutions are counterintuitive. Water snakes in captivity seem to prefer a dry environment with a water dish whereas many desert species need moisture such as a hide box with a moist sponge. Ventilation is good, but not breezy conditions. Vents at the top and bottom of the cage are best, and Ray touted the value of simple solutions, such as plastic wrap covering part of the vents as a simple way to raise humidity in an otherwise too dry cage. Fogging or misting is probably valuable for all animals, though frequency is dependent on the species.

Ray credited captive-bred animals for a greater resistance to some of the maladies that curators used to have to fight. A quick survey revealed that not one of the keepers in his audience had trouble with mouth rot or pneumonia. The Brookfield zoo would run the splayed heads and tails of shed skins through a copier machine as a record of an animal's health, but would dispose of the shed to prevent the possibility of spreading disease. An interesting technique and something I might try.

Ray's theory on pyramiding in tortoises gives more credence to heat problems than too much protein. He says that a heat "sandwich," with even heat sources from above and below, kept pyramiding to a minimum in Brookfield's tortoises. His presentation was ended with a lively discussion of the possible functions of the lymphatic system in reptiles.

And that discussion was probably a glimpse into Ray's style of management when it comes to captive animals. He encourages debate, tries to learn from the animals in his care and the people doing the caring, and adapts when he sees a need. If we as keepers take nothing else from his talk, we'll be better for following those ideas. A chance to indulge in decades of experience with keeping reptiles and amphibians, that's why I wish I were at the meeting. That's one reason I belong to the Chicago Herpetological Society.

Herpetology 2013

In this column the editorial staff presents short abstracts of herpetological articles we have found of interest. This is not an attempt to summarize all of the research papers being published; it is an attempt to increase the reader's awareness of what herpetologists have been doing and publishing. The editor assumes full responsibility for any errors or misleading statements.

MAMUSHI ECOLOGY AND CONSERVATION

K. Sasaki et al. [2012, J. Herpetology 46(4):689-695] note that the Japanese mamushi (*Gloydius blomhoffii*) has long been exploited for its medicinal value. They studied this snake's reproductive ecology on Hokkaido and assessed its vulnerability. They marked 299 individuals from 1999–2002 and kept 29 pregnant females in captivity until parturition. Pregnant females aggregated at gestation sites during summer and fall until just before parturition. Behavior suggestive of mating seasons was evident mostly in August and September. As expected, there was an apparent sex difference in body size in adults but not in neonates: females were larger than males. Consistent with previous reports, both neonates and adults were larger in Hokkaido than in southern Japan. The smallest pregnant female measured 44.8 cm in snout–vent length, which was larger than values reported from southern regions. Offspring sex ratio was statistically equal: 88 males to 105 females. Litter size averaged 6.6 offspring. Longer females tended to produce larger litters and longer neonates. The proportion of pregnant to non-pregnant females, coupled with mark–recapture data, suggested that mamushi females skip one or more years between reproductive bouts. Relative litter mass (RCM) was large (83% on average), and postpartum body condition was lower, especially so in females with larger RCM. Direct human-caused mortality was highest for pregnant females (70.2%), followed by non-pregnant females and then males. High adult mortality, particularly of pregnant females, raises a concern about population persistence, because mamushi exhibit a slow life history. The tendency of pregnant females to aggregate at predictable locations further makes mamushi populations vulnerable to human killing and exploitation.

MALE VOCAL RESPONSES CHANGED BY EARLY EXPERIENCE

B. Dawson and M. J. Ryan [2012, Copeia 2012(4):678-682] note that the acquisition of signals used in intrasexual communication is not well studied. To better understand the possible contribution of early experience to the acquisition of intrasexual responses, the authors reared Neotropical túngara frogs, *Physalaemus pustulosus*, in four acoustic environments: 1) conspecific chorus, 2) heterospecific chorus, 3) acoustic isolation, and 4) noise. For the heterospecific chorus, they chose the calls of a congener, *P. enesefae*, with which *P. pustulosus* is sympatric in parts of its distribution. They measured the evoked vocal responses (EVR) of these frogs in response to calls of the conspecifics, to calls of the congener, and to calls representing an intermediate between the two species. Male *P. pustulosus* reared hearing the calls of *P. enesefae* produced more calls overall and more complex calls in response to the call of *P. enesefae*. This is consistent with the hypothesis that the EVR of male anurans can be influenced by early experience and is the product of an interaction between genes and the environment.

SOUTH AMERICAN DWARF BOAS

F. F. Curcio et al. [2012, Herpetological Monographs 26: 80-121] report that a taxonomic study on the South American dwarf boas of the genus *Tropidophis* revealed the existence of two new species in the Atlantic Forest biome. As a result, they recognize five mainland species, three in the Atlantic Forest and two in northwestern South America. Based on general distribution and morphological orientation, the type locality of *T. paucisquamis* is restricted to Estação Biológica de Boracéia, municipality of Salesópolis, state of São Paulo, Brazil; furthermore, a lectotype for *T. taczanowskyi* is designated. The authors provide data on the hemipenial morphology of two South American *Tropidophis*, showing that the quadrifurcate condition described for West Indian taxa also occurs in mainland congeners. The distributions of the three Atlantic Forest species are congruent with patterns of diversification of other vertebrate taxa associated with cold climates prevalent at high elevations. Refugial isolation and riverine barriers may account for such speciation events.

REPRODUCTIVE ECOLOGY OF A GLASS FROG

A. Valencia-Aguilar et al. [2012, Copeia 2012(4):722-731] describe for the first time aspects of the reproductive ecology and behavior of a population of *Hyalinobatrachium aureoguttatum* located in the Colombian Pacific lowlands. Males vocalize and attend clutches from the underside of leaves overhanging the streams. Males showed high fidelity to their territory; each male repeatedly uses the same leaf for perching, calling, mating, and clutch attendance. There were no significant differences in the environmental variables registered for the microhabitats where males were located with or without clutches, with one or multiple clutches, or between successful or unsuccessful clutches, which suggest that the analyzed variables are not important for the obtention of the clutches and their success. Males were found grouped in the study area at distances varying between 0.3–0.5 m; thus, more than one male can be observed occupying other leaves in the same plant. Fights or aggressive behaviors were not observed in intrusion events by co-specific males in the territory of the resident males; however, the authors observed a series of movements that resulted in moving the intruder further away. Females almost immediately abandoned the clutches after oviposition, whereas most of the time, at day and night, males stayed near, touching or sitting on one to five egg clutches during most of their embryonic development. This brooding behavior also included hydration, cleaning, and defense of the eggs. Arthropod predation was observed in both attended and abandoned egg clutches; however, in one observation, the behavior of the male moved the predator away and saved the clutch. These observations and the finding of abandoned clutches that did not complete their development suggest that male parental care increases embryo survival and, as a result, his reproductive success.

MILKSNAKE FEEDING ECOLOGY

B. T. Hamilton et al. [2012, J. Herpetology 46(4):515-522] examined the diet of the milksnake (*Lampropeltis triangulum*) in the western United States and evaluated predictions about ontogenetic shifts, sexual divergence, and geographic variation in diet. Identifiable prey items were found in 139 specimens, and 41 additional prey items were recorded from the literature, for 180 prey items in total from 175 individual snakes. *Lampropeltis triangulum* is a generalist predator and feeds primarily on lizards and mammals. Skinks made up a large portion of the total diet. Other lizard taxa were also important prey, whereas reptile eggs, snakes, and birds were consumed infrequently. Ontogenetic shifts in diet were documented. The upper size limit of prey increased with increasing snake size, and adult snakes continued to feed on small prey. Prey type also was related to snake size. Juveniles fed more frequently on lizards, but adults fed mainly on mammals. Although males were longer than females, there was no sexual size dimorphism in mass, and there were no differences in diet between sexes. Diet varied geographically, and the proportion of endothermic prey was greater at higher latitudes after accounting for snake size.

GOPHER TORTOISE BURROW DENSITIES

T. D. Castellón et al. [2012, Chelonian Conservation and Biology 11(2):153-161] note that gopher tortoises (*Gopherus polyphemus*) occur in a variety of habitats, but are primarily associated with sandhill communities. In peninsular Florida, however, mesic flatwoods make up the largest area of habitat, and scrub often replaces sandhill on inland ridges. Tortoise ecology is poorly understood in these habitats and few data are available to guide management. The authors surveyed tortoise burrows and assessed vegetation in scrub, flatwoods, and pine plantations on flatwoods soils at Avon Park Air Force Range in south-central Florida. Densities of noncollapsed burrows in scrub (1.93/ha) and flatwoods/plantations (1.42/ha) were generally lower than is typical for sandhill (3.25–9.95/ha), although total abundance was high (>20,000) because of the large habitat area. In scrub, low burrow densities may be due to low abundance of food plants. Nonetheless, the burrow density in scrub was significantly higher than in flatwoods/plantations, where food was abundant but soils were poorly drained and burrows were often flooded. The percentage of collapsed burrows was significantly higher in scrub (53%) than in flatwoods/plantations (35%), although a higher percentage of the remaining (noncollapsed) burrows were active in scrub (23%) than in flatwoods/plantations (16%). These patterns (and data from a subsequent radiotelemetry study) suggest that tortoises in scrub maintain strong fidelity to individual burrows, and frequently abandon others, whereas tortoises in flatwoods share burrows and move among them regularly, but rarely abandon them. This sharing and continual reuse of available burrows suggests a possible limitation on suitable conditions for burrow construction in flatwoods, probably related to the high water table. Scrub and flatwoods may constitute suboptimal habitats for gopher tortoises, due to low abundance of food in scrub and poorly drained soils in flatwoods. Nonetheless, large numbers of tortoises may occupy scrub and flatwoods, necessitating better understanding of their ecology in these habitats.

DENSITY AFFECTS GOPHER TORTOISE BEHAVIOR

C. Guyer et al. [2012, Herpetological Monographs 26:122-134] compared patterns of burrow size, tortoise size, home range size and overlap, movement distances, and mating rates among six sites that differed in density of gopher tortoises (*Gopherus polyphemus*). Burrow sizes differed among sites because tortoise size distributions differed among sites, but this was due principally to the unusually small size of animals on the Conecuh National Forest site. A linear relationship between tortoise density and burrow density was documented from the six sites, suggesting that each tortoise, on average, created 2.5 burrows or that the burrow-to-tortoise conversion factor for the sites was 0.40. The average distance from a burrow to its nearest three neighbors was greater for low-density sites than for high-density sites, indicating that animals probably were more isolated from each other on sites with low tortoise densities. Home ranges were larger in males than females, a feature documented in other studies of tortoise movements. Home range sizes were greatest for densities of approximately 0.4 tortoises/ha and decreased in size above and below this density. This suggests that animals moved to visit close neighbors in areas of high density, expanded movements to maintain contact with neighbors that became more widely dispersed as density decreased, and then restricted movements to a few close neighbors as density reached extremely low levels. Home range overlap increased linearly with increasing density, suggesting that opportunities for social interactions decreased with decreasing density. When tortoises moved between burrows, males moved longer distances than females and tortoises of both sexes moved shorter distances on high-density sites than did tortoises on low-density sites, suggesting greater movement costs for males than females and for tortoises on low-density sites. Males traveled up to 500 m to visit female burrows, but most movements were < 80 m. Median movement distances of males to visit females were negatively correlated with burrow density, suggesting that cost of male movements to find mates increased as population density decreased. Based upon patterns of 95% confidence limits, rates of mountings of female tortoises approached zero when females occupied burrows approximately 200 m from neighboring burrows. If burrows were uniformly distributed 200 m apart, then reproductive failure would be a statistically supportable outcome at a density of 0.3 burrows/ha (0.12 tortoises/ha). These values are similar to the values of 0.4 tortoises/ha (1.0 burrows/ha) that the data suggest is the density at which social structure associated with movements within home ranges are altered.

RADIATED TORTOISES AS BUSH MEAT

R. C. J. Walker, and T. H. Rafeliarisoa [2012, Chelonian Conservation and Biology 11(2):223-226] report that radiated tortoises (*Astrochelys radiata*) are facing a significant extinction risk within the next few decades as a direct result of the increasing popularity of the species as bush meat. Sampling across the species range revealed a mean carcass encounter rate of 2.2/km of transect, with highest levels of poaching within the Linta and Menarandra river regions. No poaching was recorded within the 2 protected areas within the core of the species range. Improved local law enforcement, in addition to community-based conservation initiatives, is critical to combating this crisis.

EFFECTS OF CRAYFISH ON TADPOLES

M. J. Davis et al. [2012, J. Herpetology 46(4):527-534] note that habitat structure is known to influence community interactions, but its role in amphibian communities is unclear. The authors examined the effect of vegetative habitat structure, in the presence or absence of a crayfish predator (*Orconectes rusticus*) and the herbicide atrazine, on green frog (*Rana clamitans*) tadpoles reared in 10-l microcosms in the laboratory. Crayfish predators reduced green frog survival and affected activity levels and microhabitat use differently depending on the presence or absence of vegetation. In treatments with vegetation, activity levels were greater when the crayfish predator was absent, but in treatments without vegetation activity levels did not differ between predation treatments. Moreover, when a crayfish predator was present, tadpoles in treatments without vegetation spent more time at the water surface than tadpoles in treatments with vegetation. This preference for the water surface may have been a compensatory behavioral change to avoid predation because it was less likely that crayfish would be able to reach the upper portion of the tank in the absence of vegetation. Atrazine exposure did not significantly influence susceptibility of green frog tadpoles to crayfish predators or alter the impact of vegetation. The authors found that vegetative habitat structure can mediate predator–prey interactions. Contrary to previous studies they found that the presence of vegetation may benefit the crayfish predator and result in both lethal and sublethal effects on tadpole prey.

NEST PREDATION ON MAP TURTLES IN WISCONSIN

G. A. Geller [2012, Chelonian Conservation and Biology 11(2): 197-205] obtained incidental observations on nest predation dynamics at 2 map turtle (*Graptemys* spp.) nesting sites along the Wisconsin River, Iowa County, Wisconsin, during primary research on the use of electric fencing to decrease turtle nest predation. Sites were continuously monitored by digital trail cameras during the 2008–2011 reproductive seasons. Raccoons (*Procyon lotor*) displayed temporally focused turtle nest foraging efforts across both sites and years and were the only confirmed nest predators. Striped skunks (*Mephitis mephitis*), Virginia opossums (*Didelphis virginiana*), coyotes (*Canis latrans*), and American crows (*Corvus brachyrhynchos*) were less frequent on site but also displayed recurring seasonal chronologies. Nest predation levels exceeded 90%, with short nest survival timelines suggesting relatively high predation pressures on these sites.

THE TURTLES OF BHUTAN

J. T. Wangyal et al. [2012, Chelonian Conservation and Biology 11(2):268-272] present the first report on the turtles of the Himalayan Kingdom of Bhutan. They found five turtle species: *Cuora amboinensis*, *C. mouhotii*, *Cyclemys gemeli*, *Melanochelys tricarinata*, and *Indotestudo elongata*,. The record of *C. mouhotii* is a significant range extension to the west; that of *C. amboinensis* is a range extension from adjacent northeast India; and those of *C. gemeli*, *M. tricarinata*, and *I. elongata* fill geographic gaps in their known distributions. An analysis of distributions of other turtle species in adjacent eastern Nepal and northeast India suggests that additional country records of turtles may be found in Bhutan, especially in the southern lowlands of the country.

USE OF HIBERNACULA BY PINESNAKES

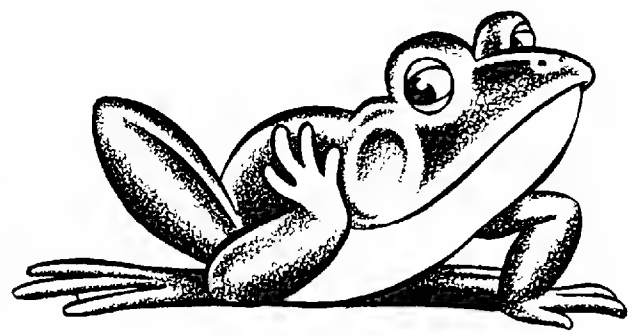
J. Burger et al. [2012, J. Herpetology 46(4):596-601] note that understanding the specific habitat requirements of reptiles during different life stages or seasons is critical to conserving viable populations. Northern pinesnakes (*Pituophis melanoleucus*) are one of the few species that spend the winter in underground hibernacula that they excavate themselves. The authors report on 26 years (1986–2011) of monitoring pinesnake use at seven hibernacula in the New Jersey Pine Barrens. The goal was to determine the frequency of repeated use, number of snakes present by year, disruptions of hibernacula, and the relationship between number of snakes present and the probability of occupancy of each hibernaculum in successive years. The overall goal was to determine the importance of protecting known hibernation sites regardless of whether they appear occupied in a given season. These data suggest that, if no snakes are observed entering a particular hibernaculum over a limited time period, it does not mean none are there or that none will use it in successive years. The variability in use suggests not only that predation and human disturbance can result in nonoccupancy the following year but that environmental and temperature-related conditions force snakes to have alternative hibernacula to reduce risk and ensure survival. Pinesnakes are listed as threatened by the New Jersey Department of Environmental Protection for many reasons, including habitat loss. There is continued pressure from developers to destroy habitat during development, including critical hibernation sites. The long-term use of specific hibernacula, even with periods of low or no use, suggests that these resources should be protected to provide a matrix of available overwintering sites.

CONSERVATION OF TURKS ISLAND BOAS

R. G. Reynolds and G. P. Gerber [2012, J. Herpetology 46(4): 578-586] note that the boid genus *Epicrates* contains 10 species in the West Indies, several of which are listed as threatened or endangered, whereas the status of the others remains unknown. Little is known about Turks Island boas (*Epicrates chrysogaster chrysogaster*), a subspecies of the Southern Bahamas boa endemic to the Turks and Caicos Islands. No published ecological studies exist for this subspecies. A long history of human habitation, greatly exacerbated by exponentially increasing development in the last several decades, appears to be threatening the remaining populations of these boas. However, a lack of basic ecological information is holding back conservation efforts. The authors report on the first multiyear ecological study of Turks Island boas, focusing on an important population located on the small island of Big Ambergris Cay in the southeastern margin of the Caicos Bank. Encounter rates of up to 3.5 snakes per person-hour make this population especially easy to study. They captured 249 snakes, 11 of which were recaptures. They provide basic natural history information including size, color pattern, girth, body temperature, abundance, diet, activity, diurnal refuge selection, and population size. They also clarify the known distribution and discuss the conservation concerns of this species. This study fills a gap in the ecological knowledge of Bahamian boas and will provide important baseline data for the Big Ambergris Cay population of Turks Island Boas as this small island undergoes extensive development over the next several decades.

The Tympanum

Croc Fest



The 2012 Christmas Croc Fest, a fundraiser for crocodilian conservation, took place on 08 December 2012 at Shawn and Jen Heflick's facility in Palm Bay, Florida, USA, raising a record US$15,000 for critically endangered Orinoco crocodiles. Croc Fest is an annual, grass-roots fundraiser supported by private individuals, businesses, and zoos, all with a common interest in conserving crocodilians. The funds raised at this year's event will be directed to Asociación Chelonia, a Madrid-based NGO that has made great progress in getting a comprehensive conservation program underway for Orinoco crocodiles in Colombia. 100% of the funds donated go to the cause, as all event expenses are covered by organizers Shawn Heflick, Flavio Morrissiey, Colette Adams, and Curt Harbsmeier.

Croc Fest has evolved into a family-friendly event, and attracted some 150 attendees who were treated to live animal displays and presentations (courtesy of Gator Adventure Productions), live music (courtesy of Daniel and Lisa Parker), BBQ (prepared fresh, on site), libations, fishing, kayaking, a silent auction and finally, a rousing live auction conducted by Joe Wasilewski and Shawn. Event-goers were also treated to a tour of Shawn's lab, where scenes in episodes of Nat Geo Wild's Python Hunters have been filmed. Finally, Luis Sigler from Dallas World Aquarium timed his delivery of two juvenile Orinoco crocodiles to Shawn's facility so that Croc Fest attendees could witness their uncrating and see and study Orinoco crocodiles up close!

Rapport between Joe and Shawn made for a very entertaining and profitable live auction. Everyone enjoyed great food and camaraderie while bidding on unique items, including authentic items from Colombia (provided by Asociación Chelonia), and items donated by zoos, businesses and individuals throughout Florida and other parts of the country.

We thank all of the individuals, businesses and zoos which supported this fundraising event.

About the Supported Conservation Program

Commercial hunting of the Orinoco crocodile began around 1929, and from that time to 1960, it is estimated that between 2 and 4 million crocodiles were killed in both Venezuela and Colombia. Until very recently, parts of Colombia have not been safe for western scientists. For this reason, less is known about the actual status of Orinoco crocodiles in the wild in Colombia versus Venezuela. Surveys now reveal that the total wild population of Orinoco crocodiles in Colombia is possibly as low as 130 adult animals, down from an estimated 780 in 1974–1975. That is why Asociación Chelonia's work is so important now.

The majority of the remaining population of this species in Colombia is located in the area where the work of Asociación Chelonia is taking place. Its program, initiated in 2010, began with surveys of the wild population in conjunction with evaluation of the crocodiles' ecosystems. With much of the groundwork for this project already laid, its proposed activities over the next two years include the following:

- Identify an adequate site for a headstart and release program, with accessibility for follow-up and enforcement of protection laws in mind
- Work with landowners to create a private reserve for a pilot reintroduction program
- Continue to conduct local and national education campaigns, including the development of web pages for children, educators and biologists
- Develop publications on the 6 species of crocodilians in Colombia and distribute these free-of-charge to educational, environmental and conservation-based entities

The budget that has been developed to conduct these activities is US$194,404.00. Not including the proceeds of Christmas Croc Fest 2012, over $120,000.00 has already been raised with support from such organizations as the Endowment Fund for Biodiversity (France), the Biodiversity Foundation (Spain), and ANP—Natural Protected Areas—in Colombia.

About Asociación Chelonia

Dedicated to the creation of scientific conservation partnerships for sustainable human development and the conservation of nature, Asociación Chelonia was formed in 1997 by the Students of Biological Sciences, Madrid. It is established at ten sites within Spanish territories and has permanent offices in six other countries. In addition to its work with Orinoco crocodiles in Colombia, its focus areas include amphibian decline, climate change and sea turtle conservation. In 2010, Asociación Chelonia entered into a five-year cooperative agreement with Corporinoquia (the government environmental authority in Colombia) to work together on Orinoco Crocodile Conservation. Additionally, this first-ever targeted-release program was included as one action item in the 1998–2008 National Program for the Conservation of Orinoco Crocodiles in Colombia.

Curt L. Harbsmeier, Harbsmeier DeZayas, LLP, 5116 S. Lakeland Drive, Lakeland, FL 33813

Unofficial Minutes of the CHS Board Meeting, January 18, 2013

The meeting was called to order at 7:47 P.M. at the Schaumburg Public Library. Board members Lawrence Huddleston and Jenny Vollman were absent.

Officers' Reports

Recording Secretary: In Jenny's absence Mike Dloogatch read the minutes of the December 14, 2012, board meeting and they were accepted.

Treasurer: Andy Malawy presented the December financial report..

Membership Secretary: Mike read the list of expiring memberships and said we are steady at around 500 members.

Sergeant-at-arms: Jim Foster counted 28 people at the December meeting.

Committee Reports

Shows:
• Notebaert Nature Museum, first full weekend of each month. Josh Chernoff is coordinator.
• Chinese New Year, Garfield Park Conservatory, January 19.
• Nature on Tap, Notebaert Nature Museum, 5:30 P.M., January 22.
• Chicago Outdoor Sports Show, Donald E. Stephens Convention Center, Rosemont, January 23–27
• Repticon, Kane County Fairgrounds Prairie Event Center, St. Charles, January 26–27
• Great Lakes Pet Expo, Wisconsin Exposition Center, Milwaukee, February 2.
• Winter Fest, Hidden Oaks Nature Center, 11 A.M. – 3 P.M., February 16
• Kids Expo, Schaumburg Convention Center, March 9–10
March 10: Reptile Rampage in Lake Forest
• Chicagoland Family Pet Expo, Arlington Park Racecourse, March 15–17, 2013.

Old Business

Banners: Mike Scott suggested that any new banners should be no more than about 5' wide, so that they fit more neatly behind a 6' table.

The Grants Committee will meet on February 10 at the home of Steve and Amy Sullivan in Brookfield.

Junior Herpers club: The board discussed possibilities for advertising the club.

New Business

Theresa Savino reported that the CHS needs a new laptop for keeping track of the library. Cindy moved to allocate $700 to get two new laptops, Josh seconded. The motion passed with all in favor. Theresa will look for two new laptops, one a base model and one a nicer model.

Aaron LaForge volunteered to look into the cost of a new projector.

David Hoff can set up a library website which would cost $25 for life and list the library contents online.

Josh Baity will look into prices for lapel microphones.

Round Table

.Cindy was mad that there was snow on the ground in Los Angeles and she could not wear her flip-flops.

Josh has an Amazon treeboa that he hopes is giving birth during the meeting.

John's daughter Grace had an interview at U of I Vet School.

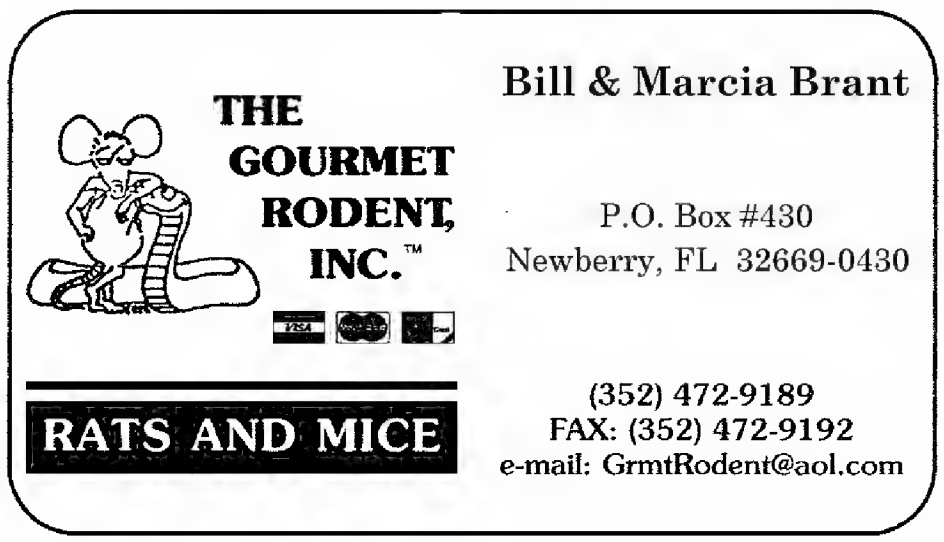
Theresa said that her daughter Molly has a friend is making a video on their iguana.

Linda found out that Ilene Sievert passed away peacefully at home on December 17, 2012, of cancer. Mike plans to republish some of the essays that Ilene wrote over the years for the *Bulletin*.

Stephanie is going to Sanibel Island, Florida, in March to do field research on gopher tortoises.

The meeting was adjourned at 9:04 P.M.

Respectfully submitted for the recording secretary by Stephanie Cappiello



Advertisements

For sale: rats and mice—pinkies, fuzzies and adults. Quantity discounts. Please send a SASE for pricelist or call Bill Brant, *THE GOURMET RODENT*, PO Box 430, Newberry, FL 32669-0430, 352-472-9189, E-mail: GrmtRodent@aol.com.

For sale: **highest quality frozen rodents**. I have been raising rodents for over 30 years and can supply you with the highest quality mice available in the U.S. These are always exceptionally clean and healthy with no urine odor or mixed in bedding. I feed these to my own reptile collection exclusively and so make sure they are the best available. All rodents are produced from my personal breeding colony and are fed exceptional high protein, low fat rodent diets; no dog food is ever used. Additionally, all mice are flash frozen and are separate in the bag, not frozen together. I also have ultra low shipping prices to most areas of the U.S. and can beat others shipping prices considerably. I specialize in the smaller mice sizes and currently have the following four sizes available: Small pink mice (1 day old—1 gm) , $25 /100; Large pink mice (4 to 5 days old—2 to 3 gm), $27.50 /100; Small fuzzy mice (7 to 8 days old—5 to 6 gm) , $30/100; Large fuzzy mice / hoppers (10 to 12 days old—8 to 10 gm), $35/100 Contact Kelly Haller at 785-234-3358 or by e-mail at kelhal56@hotmail.com

For sale: High quality, all locally captive-hatched tortoises, all bred and hatched here in the upper midwest. Baby leopards, Sri Lankan stars, and pancakes usually available, and are all well-started and feeding great! Leopards are $125 ea., Sri Lankans (2012 hatched) $475 ea. And Pancakes are $195 ea. Leopards for out of state sale/shipping require a veterinary health certificate (inquire for cost). E-mail at KKranz1@wi.rr.com or call Jim or Kirsten at 262 654 6303.

Herp tours: **Costa Rica herping adventures**. Join a small group of fellow herpers for 7 herp-filled days. We find all types of herps, mammals, birds,and insects, but our target is snakes. We average 52 per trip, and this is our 10th year doing it. If you would like to enjoy finding herps in the wild and sleep in a bed at night with air-conditioning, hot water and only unpack your suitcase once, instead of daily, then this is the place to do it. Go to our web-site http://hiss-n-things.com and read the highlights of our trips. Read the statistics of each trip and visit the link showing photos of the 40 different species we have found along the way. E-mail at jim.kavney@gmail.com or call Jim Kavney, 305-664-2881.

Herpetological Researcher/Educator Internships: Research 4 Reptiles, LLC. is seeking two volunteer interns, ages 18 years and older, for the Summer 2013 season to assist in all aspects of herpetological research and educational classes. Our mission is to provide challenging, hands-on, field-based programs for participants ages 12 years and older to inspire enthusiasm for and understanding of native Illinois reptile and amphibian species. All educational programs are taught entirely outdoors at Midewin National Tallgrass Prairie in Wilmington, Illinois, and are limited to 8 participants. Internship details can be found on our website at: http://www.research4reptiles.biz. Email Holly Zak at research4reptiles@comcast.net or call 630-337-0757 for questions.

Line ads in this publication are run free for CHS members—$2 per line for nonmembers. Any ad may be refused at the discretion of the Editor. Submit ads to mdloogatch@chicagoherp.org.

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2013 CHS GRANT RECIPIENTS

The CHS Grants Committee has chosen the CHS grant recipients for 2013. The committee consisted of John Archer, Michael Dloogatch, Jim Foster, Jason Hood, Amy Sullivan and Steve Sullivan. This year we received 26 applications, as usual exceeding the number of grants that could be awarded based on available funds. After a difficult decision process, 8 grants were awarded, in varying amounts, as follows:

- Iwo P. Gross, Eastern Illinois University (undergraduate).. "Assessing and Alleviating the Negative Effects of Vehicle Access on a Snake Community within a State Park," $1,000.
- Matthew L. Holding, Department of Evolution, Ecology and Organismal Biology, Ohio State University. "A Tale of Two Traits: Do Coevolutionary Processes Shape the Venoms of Northern Pacific Rattlesnakes and Resistance Levels of California Ground Squirrels?" $500.
- João Pedro Moura da Costa Maia, Centro de Investigação em Biodiversidade e Recursos Genéticos da Universidade do Porto (Vairão, Portugal). "In Cold Blood: Community Ecology of Reptile Hemoparasites," $1,000.
- Micah W. Perkins, Biology Department, University of Louisville. "Dietary Resource Partitioning among Watersnakes in Northwestern Kentucky," $1,000.
- Kimberly E. Schmidt, Cooperative Wildlife Research Laboratory, Southern Illinois University Carbondale. "Habitat Selection of Ornate Box Turtles (*Terrapene ornata ornata*) within Restored and Remnant Tallgrass Prairie," $!,000.
- Jaime Villacampa Ortega, Departamento de Ecología, Universidad Autónoma de Madrid (Spain). "Changes in Amphibian Assemblages along an Elevational Gradient at the Manu Biosphere Reserve, Southern Peru," $500.
- Daniel B. Wylie, Illinois Natural History Survey. "Ongoing Health Assessment and Prevalence of *Chrysosporium* in the Eastern Massasauga (*Sistrurus catenatus catenatus*)," $1,000.
- Michael L. Yuan, Cornell University (undergraduate). "Characterization of Cryptic Kin Structure in Gopher Tortoises (*Gopherus polyphemus*) at Archbold Biological Station," $1,000.

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UPCOMING MEETINGS

The next meeting of the Chicago Herpetological Society will be held at 7:30 P.M., Wednesday, February 27, at the Peggy Notebaert Nature Museum, Cannon Drive and Fullerton Parkway, in Chicago. The speaker will be **Dustin Rhoads**, author of *The Complete Suboc*. Dusty will speak on his favorite topic, trans-Pecos ratsnakes, *Bogertophis subocularis*.

At the March 27 meeting **Gerry Salmon** of Boerne, Texas, will present a program on "Saving Herps --- One at a Time: Working as a Timber Rattlesnake Monitor on the Tennessee Gas Pipeline in Northern New Jersey and Northeastern Pennsylvania." Gerry has been an avid naturalist for most of his 51 years. He has a strong interest in herpetology and especially geographic distribution of North American reptiles and amphibians. He is also a long-term contributor to northeastern timber rattlesnake (*Crotalus horridus*) field biology and conservation efforts that became the basis for a recent seasonal job. His presentation consists of highlights of that work and is an opportunity to see some interesting herps of the Northeast. Gerry has spoken several times in the past at our monthly meetings on kingsnakes of the *mexicana* complex, timber rattlesnakes, and herping in South Carolina.

The regular monthly meetings of the Chicago Herpetological Society take place at Chicago's newest museum—the **Peggy Notebaert Nature Museum**. This beautiful building is at Fullerton Parkway and Cannon Drive, directly across Fullerton from the Lincoln Park Zoo. Meetings are held the last Wednesday of each month, from 7:30 P.M. through 9:30 P.M. Parking is free on Cannon Drive. A plethora of CTA buses stop nearby.

Board of Directors Meeting

Are you interested in how the decisions are made that determine how the Chicago Herpetological Society runs? And would you like to have input into those decisions? If so, mark your calendar for the next board meeting, to be held at 7:30 P.M., March 15, in the adult meeting room on the second floor of the Schaumburg Township District Library, 130 S. Roselle Road, Schaumburg..

The Chicago Turtle Club

The monthly meetings of the Chicago Turtle Club are informal; questions, children and animals are welcome. Meetings normally take place at the North Park Village Nature Center, 5801 N. Pulaski, in Chicago. Parking is free. For more info visit the group's Facebook page.

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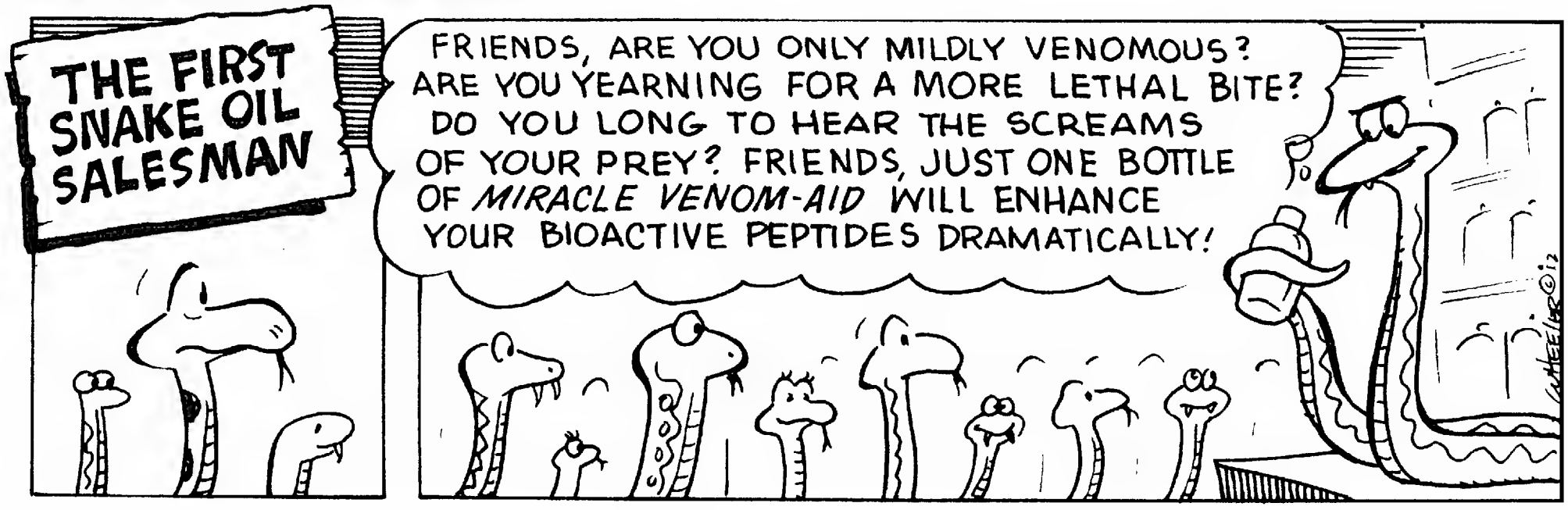
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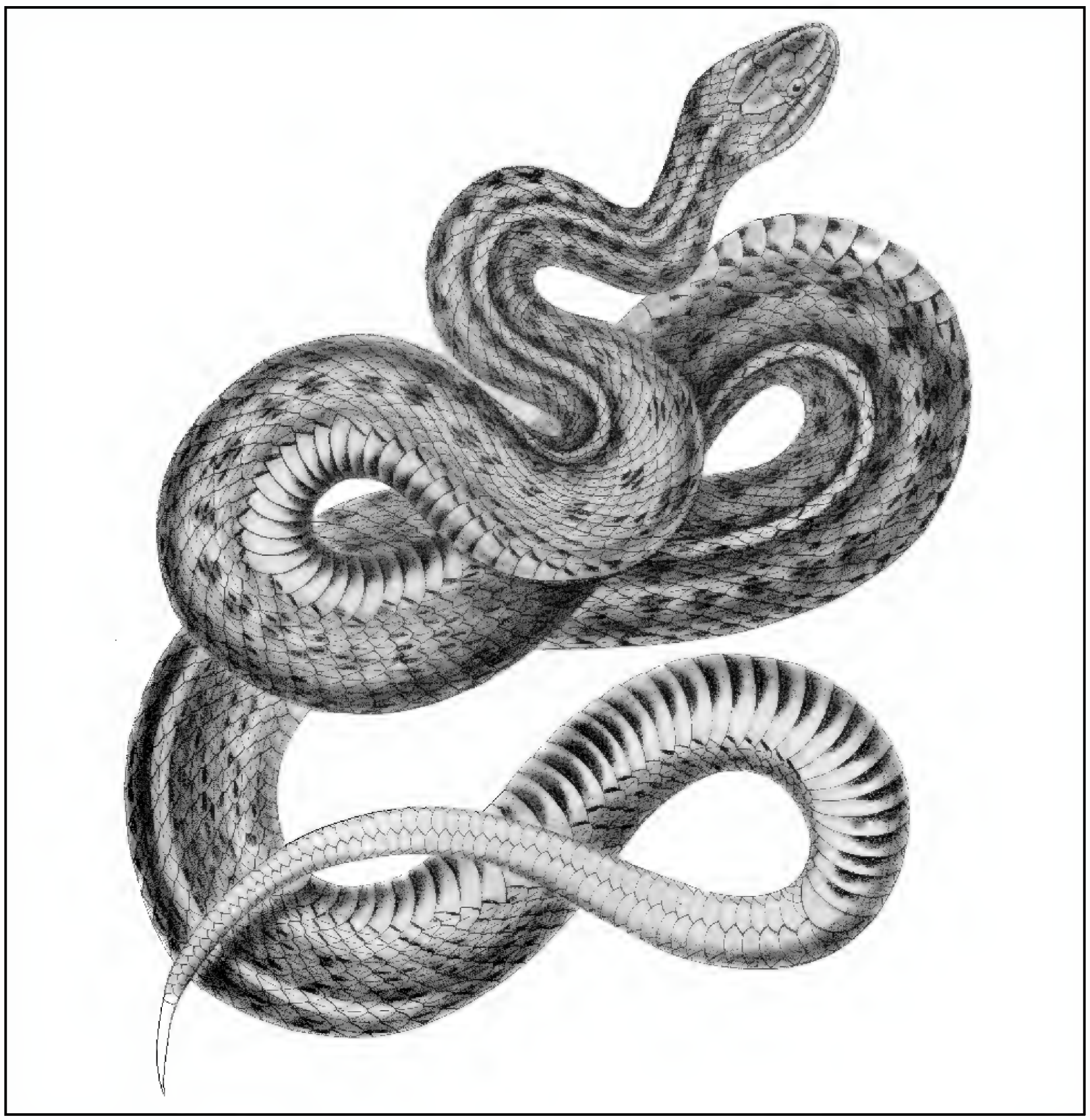

BULLETIN OF THE CHICAGO HERPETOLOGICAL SOCIETY
Volume 48, Number 3
March 2013

Aggregations of Brownsnakes, *Storeria dekayi* (Holbrook, 1836), at a Site in Northwestern Pennsylvania . . . . . Brian S. Gray 33

Notes on Reproduction of Greater Earless Lizards, *Cophosaurus texanus* (Squamata: Phrynosomatidae), from New Mexico . . . . . Stephen R. Goldberg 39

The Tympanum . . . . . Colette Adams 42

What You Missed at the February Meeting . . . . . John Archer 43

Herpetology 2013 45

Unofficial Minutes of the CHS Board Meeting, February 15, 2013 46

Advertisements 47

News and Announcements: Indianapolis Zoo Trip 48

Cover: Wandering gartersnake, *Thamnophis elegans vagrans*. Drawing (as *Eutaenia vagrans*) from *Reports of Explorations and Surveys, to Ascertain the Most Practicable and Economical Route for a Railroad from the Mississippi River to the Pacific Ocean*, Vol. X, No. 3, by Spencer Fullerton Baird, 1859.

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Aggregations of Brownsnakes, *Storeria dekayi* (Holbrook, 1836), at a Site in Northwestern Pennsylvania

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Introduction

Aggregations represent nonrandom use of space, and are often influenced by scarce resources such as prey, shelter, hibernacula, or basking sites (Gregory et al., 1987; Vitt and Caldwell, 2009). Aggregations may occur at different times of the year for various purposes. For instance, during autumn in northern latitudes some snake species aggregate at dens to hibernate; the following spring, these same snakes may aggregate near the den following emergence to mate. In Erie County, Pennsylvania, northern watersnakes (*Nerodia sipedon*) have been observed aggregating in vegetation to bask and possibly to mate (Figure 1). After dispersal from the den, snakes may be found during the active season in aggregations under cover objects. Suggested benefits of aggregating include a reduction in the rate of water loss, provide a short-term advantage with regard to heat loss, may provide an increased chance of mating, and possibly increases the survival of individual young (Noble and Clausen, 1936; Gillingham, 1987; Rossman et al., 1996). Noble and Clausen (1936) studied the aggregation behavior of the brownsnake (*Storeria dekayi*) in the laboratory and reported that vision and olfaction were the senses primarily involved. Reports regarding aggregation behavior of the brownsnake, (*S. dekayi*) in Pennsylvania are scarce (although see Lachner [1942] and Ernst [2003]). In the present study I sought to document aggregation behavior of *S. dekayi* at a site in Millcreek Township, Erie County, Pennsylvania, in order to augment our knowledge of this species in the commonwealth.

Figure 1. An aggregation of northern water snakes, *Nerodia sipedon*, basking in common buttonbush, *Cephalanthus occidentalis*. The aggregation consisted of a single adult female and four adult males. Image taken at Asbury Woods, Erie County, Pennsylvania.

Study site

The study site is within the glaciated Central Lowland Province of northwestern Pennsylvania and consists of approximately 0.5 ha of vegetated slope abutting the western side of the Highway (Hwy) 832 bridge (Figure 2) in Millcreek Township, Erie County. The slope was dominated by crown vetch (*Coronilla varia*), mugwort (*Artemisia vulgaris*), goldenrod (*Solidago* sp.), and late flowering thoroughwort (*Eupatorium serotinum*). Also present along the base of the slope were a few well separated small trees and shrubs (boxelder, *Acer negundo*; red-osier dogwood, *Cornus stolonifera*; honeysuckle, *Lonicera* sp.; and ash, *Fraxinus* sp.). To the west of the slope, the terrain is relatively flat and consist of ca. 3.25 ha of palustrine forest, with eastern cottonwood (*Populus deltoides*), silver maple (*Acer saccharinum*), green ash (*Fraxinus pennsylvanica*), and pussy willow (*Salix discolor*) dominating. The site, including the palustrine forest, is bounded to the north and south by residential and industrial development. The bridge creates a formidable barrier to the east. Pre-existing debris at the site included pressed wood panels, boards, shingles, linoleum, and cardboard. The herpetofauna of adjacent property to the west of the site has been reported in Gray (2007; 2009; 2011); a detailed study of the natural history of *S. dekayi* from the site is in preparation (Gray, in press).

Materials and methods

Pre-existing debris objects (n = 16) formed a 68.5 m north-

Figure 2. The slope along the Highway 832 bridge in Erie County, Pennsylvania. Brown snakes, *Storeria dekayi*, were found in aggregations beneath debris alongside the bridge on 48 occasions.

south transect along the Hwy 832 bridge; four additional debris objects ran perpendicular to the bridge along the southern edge of a parking lot, forming a 25 m west-east transect.

Snakes were hand captured, sexed, weighed, and their snout–vent length (SVL) and tail length (tl) measured to the nearest millimeter. Surface body temperature of snakes (BT) was taken with a hand-held infrared thermometer (Raytec MT-6) precise to 0.2 °C (accuracy of ±1% between 10 and 30 °C and ±1.5% outside this range). The thermometer was held approximately 200 mm from the snake and in line with the snake's body axis (Hare et al., 2007). Snakes were individually marked with a portable cautery unit as described by Winne et al. (2006) and released at the site of capture after processing. Adult females were gently palpated to determine if they were gravid; in several instances later captures confirmed determination of gravidity. If a snake was in pre-ecdysis (i.e., opaque cast to its skin) or had recently shed its skin, this information was recorded. I also noted any scale anomalies, such as cleft or fused scales, and whether or not the tail was complete. General descriptions of the pattern of dorsal spots and/or barring were recorded to aid in individual recognition. As per Hulse et al. (2001) males that were at least 175 mm SVL, and females that were at least 225 mm SVL were considered to be adults; those found to be less than the respective values were classified as juveniles. When two or more snakes were found beneath the same cover object, not necessarily in contact, they were considered to be aggregated.

Results

Of a total of 308 *S. dekayi* observed, 39% (n = 120) were individuals in aggregations. Aggregations of *S. dekayi* were observed on 48 occasions and consisted of 2 to 7 snakes. Twenty-eight percent (n = 33) of snakes found in aggregations were either opaque or had recently shed. The most frequently observed aggregations consisted of a single male and female (n = 16); two males (n = 12); and two females (n = 8). Aggregations involving three to seven *S. dekayi* were observed much less frequently (Table 1). The greatest number of aggregations occurred during April (n = 16). Excluding June and July, when no conspecific aggregating behavior was observed, the least number of aggregations occurred in October, with a single aggregation (Figure 3). Aggregations during the spring months (March–May) were adult biased, with the resulting adult (n = 45) to juvenile (n = 21) ratio being 1:0.5. Aggregations during August through October were juvenile biased, with the resulting adult (n = 5) to juvenile (n = 49) ratio being 1:9.8.

Between 18 April and 26 May, gravid female *S. dekayi* were found in aggregations on six occasions. Aggregations were as follows: a gravid female with an adult male (n = 3); two gravid females (n = 1), two gravid females with two adult males (n = 1); a gravid female with one juvenile and four adult males (n = 1).

Body temperature (BT) of *S. dekayi* found in aggregations averaged 18.3 °C (sd = 6.64, range: -0.2-25.8, n = 63). The temperature of -0.2 °C was observed in two *S. dekayi* on 29 April 2012 and represents the lowest BT reported for the species (Gray, in press). The appendix at the end of this report provides a summary of each conspecific aggregation of *S. dekayi* that was observed at the Erie County site.

Table 1. Frequency and composition of aggregations of *Storeria dekayi* observed at the Hwy 832 site in Erie County, Pennsylvania. Due to rounding, the individual percentages do not add to 100.00.

Aggregation type	Frequency	% of total
♂♀	16	33.33
♂♂	12	25.00
♀♀	8	16.67
♂♀♀	3	6.25
♂♂♀	2	4.17
♀♀♀	1	2.08
♂♂♀♀	2	4.17
♂♂♂♀	1	2.08
♀♀♀♀	1	2.08
♂♂♂♂♂♀♀	1	2.08
♂♂♂♂♂♂♀	1	2.08
Total	**48**	**99.99**

Storeria dekayi were observed in association with *Thamnophis sirtalis* on nineteen occasions. Most interspecific aggregations involved a single *S. dekayi* with a single *T. sirtalis* (n = 7), although on one occasion four *S. dekayi* with one *T. sirtalis* was observed (Table 2). Aggregations of a single *S. dekayi* and a single juvenile *Lampropeltis triangulum* were observed twice.

Discussion

An aggregation of five hibernating *Storeria dekayi* from Mercer County, Pennsylvania was reported by Lachner (1942). Exclusive of hibernating aggregations, Ernst (2003) noted that as many as six *S. dekayi* were found using the same shelter at one of his southeastern Pennsylvania site. At a nearby site, Ernst

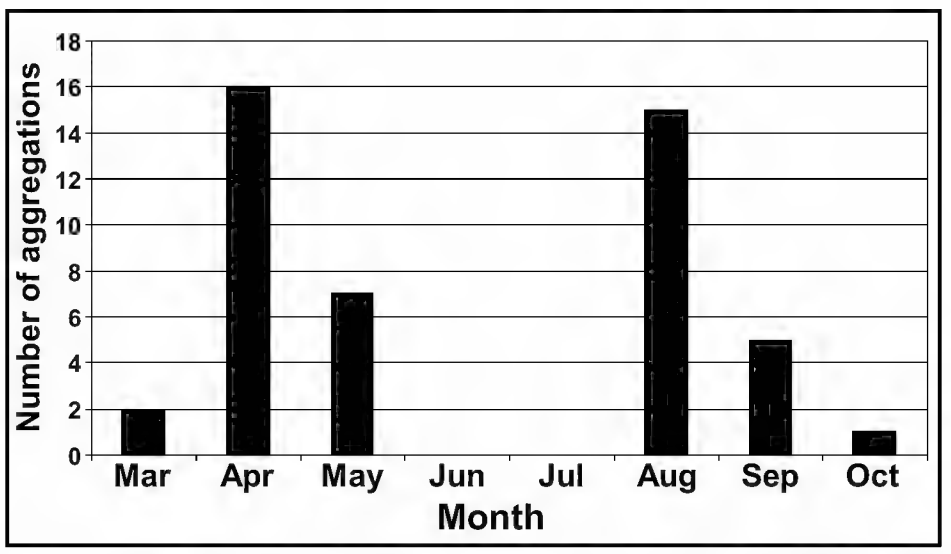

Figure 3. Monthly summary of aggregations of *Storeria dekayi* found at the Hwy 832 site in Erie County, Pennsylvania.

Table 2. Summary of interspecific aggregations of *Storeria dekayi* and *Thamnophis sirtalis* at the Hwy 832 site in Erie County, Pennsylvania.

Composition of aggregation		
# of *S. dekayi*	**# of *T. sirtalis***	**Observed frequency**
1	1	7
1	2	5
1	3	1
1	4	1
2	1	4
4	1	1

did not find any *S. dekayi* aggregating. At the same southeastern Pennsylvania sites, spring and fall aggregations at hibernacula ranged from 2-13 snakes (Ernst 2003). Noble and Clausen (1936) reported that over 79% (approximately 397 snakes) of *S. dekayi* that they found were under cover in aggregations of 2–12 snakes. The percentage of aggregating *S. dekayi* at the Erie County site was lower (39%) than that observed by Noble and Clausen, as was the maximum aggregation size of seven snakes. The large number of aggregations found in April is expected, as snakes would be concentrated near hibernacula after emergence. Such concentrations of conspecifics may be beneficial, as the aggregated snakes need not make long journeys to find mates (Gillingham, 1987). One would expect to see increased numbers of aggregations in the fall when snakes are returning to the den, however, this was not the case at the Erie County site. The return of snakes to hibernacula in September and October may be more gradual than the rate of emergence in the spring. The highest number of aggregations observed following the lack of observations in June and July occurred in August and were the result of parturition (Gray, in press). Neonate *S. dekayi* are known to aggregate and prefer to do so with conspecifics (Burghardt, 1983), as such, one would expect juvenile Brown Snakes to be found aggregating with conspecifics more often than with other species, such as *T. sirtalis*. At the Erie County site juvenile and young-of-the-year *S. dekayi* were more often found with conspecifics. Other factors potentially responsible for the observed differences in frequencies of conspecific and interspecific aggregations include feeding behavior and habitat use. *Storeria dekayi* are reported to feed more often early in the evening or at night (Ernst and Ernst, 2003), and were found under cover in the mornings. Whereas *T. sirtalis* is reported as being more diurnal (Ernst and Ernst, 2003), and was more likely to be found beneath cover in the early evenings (pers. obs.). As was expected, aggregations in the fall were juvenile biased and were similar to the total adult to juvenile ratio (1:3.92) at the site (Gray, in press).

Clausen (1936) noted that gravid female *S. dekayi* were found isolated during June and July. This was true at the Erie County site as well, with no aggregating *S. dekayi* being found during these two months. This is contrary to aggregation behavior by gravid females of the closely related Red-bellied Snake, *S. occipitomaculata* which are found in aggregations during summer (Ernst and Ernst, 2003). Predators often aggregate at sites of high prey availability; however, as prey become less abundant the predators disperse (Gregory et al., 1987). During spring and fall at the Erie County site, slugs were frequently found aggregating beneath cover objects (Figure 4). On one occasion as many as 35 *Deroceras reticulatum* were found beneath a single cover object. This may in part explain the observed abundance of aggregation behavior of *S. dekayi* in spring, as well as the lack of aggregations in summer when prey (i.e., slugs) were scarce. *Storeria dekayi* use the olfactory organs, tongue, and Jacobson's organ to trail prey (Noble and Clausen, 1936). It is possible that snakes could follow scent trails left by slugs and or conspecifics to cover boards, thus encouraging aggregating behavior (Catling and Freedman, 1980).

Storeria dekayi are known to return to the same cover object during ecdysis (Gray, 2008; Gray, in press), and such behavior could potentially promote aggregating behavior. If vision is impaired during ecdysis, individuals aggregating at this time may gain by being in a group. If a predator is attempting to consume a member of the group, the others may escape (Gregory et al., 1987). During March–May and August–October the percentage of *S. dekayi* found opaque or recently shed (33 of 120; 28%)

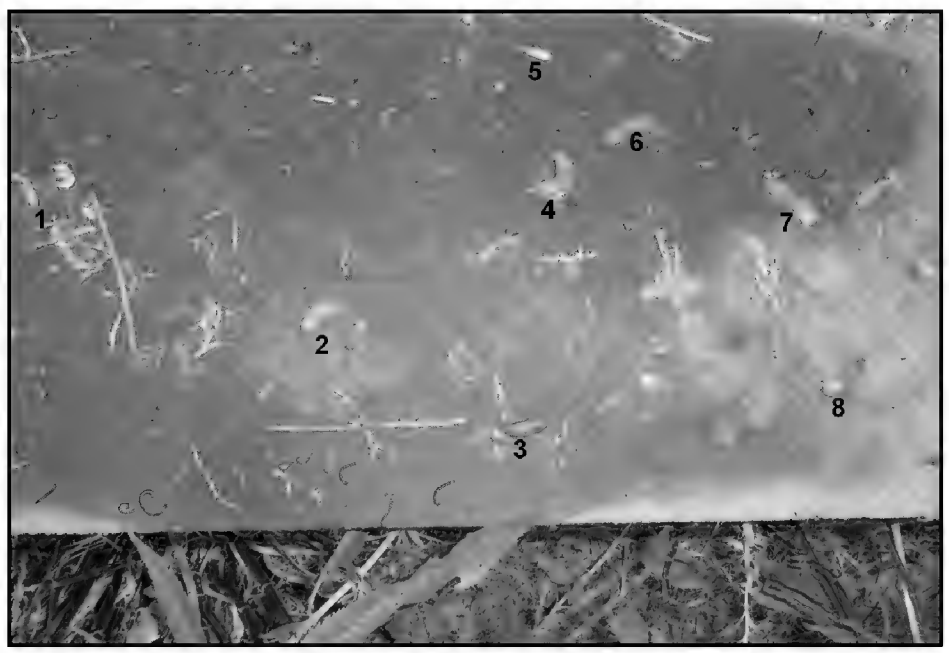

Figure 4. Slugs found on the underside of a cover object at the Hwy 832 site. Slugs 1 and 5 are *Deroceras reticulatum*; the remaining slugs are *Arion* sp. Both genera are preyed upon by *Storeria dekayi* at the site.

Figure 5. Milksnake, *Lampropeltis triangulum*, consuming a juvenile *Storeria dekayi* at the Hwy 832 site in Erie County, Pennsylvania.

was slightly higher than *S. dekayi* found in the same condition but not aggregating (33 of 140; 24%). However, further investigation into *S. dekayi* aggregation behavior during ecdysis is needed to determine whether or not this is coincidental.

While snakes may choose to aggregate at sites that provide thermally optimum conditions, this cannot be determined from the BT data in the present study. More than likely, BTs of aggregating *S. dekayi* at the Erie County site represent temperatures passively experienced by the snakes, and not necessarily temperatures chosen by them. This is especially true of snakes found early in the morning.

During hibernation *S. dekayi* have been reported to aggregate with *N. sipedon*, *Opheodrys vernalis*, *S. occipitomaculata*, *T. butleri*, *T. sauritus* and *T. sirtalis* (Noble and Clausen, 1936; Carpenter, 1953; Wright and Wright, 1957; Pisani, 2009). Pisani and Pittman (2009) observed spring and fall aggregations of *S. dekayi* at or near ant nests that were used as hibernacula in Kansas. Interspecific aggregations during hibernation were not observed at the Erie County site; however, it is possible that *S. dekayi* and *T. sirtalis* could share hibernacula as these two species were found together on nineteen occasions during the active season. Elsewhere in Erie County, Pennsylvania, I have found *S. dekayi* and *T. brachystoma* under the same cover object. Since juvenile milksnakes are known to prey on *S. dekayi* at the Erie County site (Figure 5), it is not surprising that these two species were found together under the same cover object only twice. Incidentally, *S. dekayi* at the Erie County site were never found under cover objects where Short-tailed Shrews (*Blarina brevicauda*) were recently found. Milk Snakes and shrews are known predators of *S. dekayi* (Ernst and Barbour, 1989; Gray, in press) and it would therefore benefit *S dekayi* and other small snakes to avoid areas used by these predators.

Storeria dekayi is relatively common in northwestern Pennsylvania (Gray and Lethaby, 2008); however, some traits of its natural history (e.g., aggregation behavior, population size) are not well known from within the commonwealth (Ernst, 2003; Meshaka, 2010). The data regarding aggregation behavior by *S. dekayi* presented here augments our knowledge of this species in Pennsylvania.

Acknowledgments

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Appendix

The following is a complete list of all conspecific aggregations of brownsnakes, *Storeria dekayi*, observed at the Hwy 832 site in Erie County, Pennsylvania. Included is the date the aggregation was observed; the size of the aggregation; the composition of the aggregation. On some dates, more than one aggregation was observed, and these are listed separately. In the adult female column, the number of asterisks indicates the number of adult females in the aggregation that were gravid. For example, on 28 April 2012 four aggregations were observed; the first was an aggregation of four *S. dekayi*, including two adult males and two adult gravid females.

	Aggregation	Aggregation Composition			
Date	**Size**	**Adult ♂**	**Adult ♀**	**Juvenile ♂**	**Juvenile ♀**
21 March 2012	4			2	2
22 March 2012	2			1	1
16 April 2012	2	1			1
17 April 2012	2	2			
17 April 2012	2				2
18 April 2012	2	2			
18 April 2012	2	1	1*		
21 April 2012	2	1	1*		
21 April 2012	7	4	1*	1	1
21 April 2012	7	3		3	1
26 April 2012	2	2			
26 April 2012	2	2			
28 April 2012	4	2	2**		
28 April 2012	2	2			
28 April 2012	3	1	1	1	
28 April 2012	2	1		1	
29 April 2012	2	2			
30 April 2012	2	1	1		
5 May 2012	2	2			
12 May 2012	2	1	1		
16 May 2012	2	2			
18 May 2012	3	1			2
25 May 2012	2	1	1*		
26 May 2012	2		2**		

Appendix (cont'd)

Date	Aggregation Size	Aggregation Composition			
		Adult ♂	Adult ♀	Juvenile ♂	Juvenile ♀
29 May 2012	2			1	1
8 August 2012	2		2		
14 August 2012	2	1		1	
14 August 2012	2			2	
18 August 2012	3			1	2
18 August 2012	4				4
20 August 2012	2			2	
20 August 2012	2			1	1
20 August 2012	4			3	1
20 August 2012	2				2
24 August 2012	2			1	1
24 August 2012	2			1	1
27 August 2012	2	1			1
28 August 2012	2			1	1
28 August 2012	2			1	1
31 August 2012	2				2
1 September 2012	2				2
1 September 2012	2			1	1
8 September 2012	3			2	1
8 September 2012	2				2
19 September 2012	3			1	2
24 September 2012	2		1		1
29 September 2012	3				3
6 October 2012	2			1	1

Bull. Chicago Herp. Soc. 48(3):39-42, 2013

Notes on Reproduction of Greater Earless Lizards, *Cophosaurus texanus* (Squamata: Phrynosomatidae), from New Mexico

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Abstract

The reproductive cycle of *C. texanus* from New Mexico was examined utilizing a histological analysis of museum specimens. Reproductive activity in both sexes occurred from April to August. A new minimum size for sexual maturity (SVL = 48 mm) was reported for *C. texanus* males. Mean clutch size (n = 13) was 4.6 ± 1.3 SD, range = 2–7. The smallest reproductively active female (oviductal eggs) measured 48 mm SVL.There was a significant positive correlation between female body size and clutch size. The statement of Fitch (1985) that smaller clutch sizes of *C. texanus* in the western part of its range are associated with lower amounts of precipitation merits subsequent investigation.

The greater earless lizard, *Cophosaurus texanus* Troeschel, 1852, occurs in central and west Texas, New Mexico, Arizona and in northeastern Sonora to western Tamaulipas, Mexico, where they inhabit sandy washes and rocky hillsides (Howland, 2009). In New Mexico it ranges from 900 to about 2100 m (Degenhardt et al., 1996). Detailed works on reproduction of *C. texanus* are by Johnson (1960); Ballinger et al. (1972); Howland (1992); Sugg et al. (1995); Smith et al. (1987); Punzo (2007). Anecdotal information on *C. texanus* reproduction is in Smith (1946); Cagle (1950); Stebbins (1954; 2003); Fitch (1970); Parker (1973); Schrank and Ballinger (1973); Vitt (1977); Behler and King (1979); Brennan and Holycross (2005, 2006). The purpose of this paper is to provide additional information on the reproduction of *C. texanus* as part of an ongoing survey of the reproductive cycles of western North American lizards (see for example, Goldberg, 2010, 2012). New information on the minimum size for *C. texanus* male reproduction is presented.

Methods

A sample of 105 *C. texanus* consisting of 69 adult males, (mean snout–vent length, SVL = 64.7 mm ± 8.4 SD, range = 47–78 mm), 35 adult females (mean SVL = 58.3 mm ± 4.9 SD, range = 47-65 mm) and 1 sub-adult female (SVL = 45 mm) from New Mexico (Appendix) was examined from the herpetology collection of the Natural History Museum of Los Angeles County (LACM), Los Angeles, California, USA. *Cophosaurus texanus* were collected 1945–1973.

A small incision was made in the lower part of the abdomen and the left gonad was removed for histological examination. Enlarged ovarian follicles (> 4 mm) or oviductal eggs were counted. Gonads were embedded in paraffin, sections were cut at 5 µm, and stained with Harris hematoxylin followed by eosin counterstain (Presnell and Schreibman, 1997). Histology slides were deposited in LACM. An unpaired *t*-test was used to test for differences between male and female SVLs and the relationship between female body size (SVL) and clutch size was examined by linear regression analysis both using Instat 3 (Graphpad, San Diego, CA).

Results

The mean body size (SVL) of my male sample was significantly larger than the mean of my female sample (unpaired *t* test, $t = 4.2$, $df = 102$, $P < 0.0001$). Monthly stages in the testicular cycle are in Table 1. Four stages in the testicular cycle were present: (1) regressed, seminiferous tubules are at their smallest sizes and contain spermatogonia and interspersed Sertoli cells; (2) recrudescence, a proliferation of germ cells for the next period of spermiogenesis is evident, as primary and secondary spermatocytes are present; (3) late recrudescence, occurs just prior to the start of spermiogenesis. Secondary spermatocytes

Table 1. Monthly stages in the testicular cycle of 69 *Cophosaurus texanus* from New Mexico.

Month	*n*	Regressed	Recrudescence	Late Recrudescence	Spermiogenesis
April	8	0	0	2	6
May	19	0	1	1	17
June	10	0	0	0	10
July	9	0	0	0	9
August	19	17	1	0	1
September	4	3	1	0	0

Table 2. Monthly stages in the ovarian cycle of 35 *Cophosaurus texanus* from New Mexico.

Month	*n*	Quiescent	Early yolk deposition	Enlarged follicles > 4 mm	Oviductal eggs
April	6	3	3	0	0
May	15	5	3	5	2
June	1	0	0	1	0
July	9	0	1	6*	2**
August	2	2	0	0	0
September	2	2	0	0	0

* 2 clutches were damaged and could not be counted
** 2 clutches were damaged and could not be counted

and spermatids predominate; (4) spermiogenesis, lumina of the seminiferous tubules are lined by sperm or clusters of metamorphosing spermatids. The period of spermiogenesis encompassed March through July, although one of 19 males from August (5%) exhibited spermiogenesis (Table 1). Testicular recrudescence commenced in late summer and was completed the following spring (Table 1). The smallest reproductively active male measured 48 mm SVL (LACM 4240) and was collected in May. This is a new minimum size for *C. texanus* male reproduction. Another male (SVL = 47 mm) from May (LACM 4235) exhibited testicular recrudescence and would likely have commenced spermiogenesis during the current reproductive season.

Four stages were present in the ovarian cycle (Table 2): (1) quiescent, no yolk deposition in progress; (2) early yolk deposition; (3) enlarged ovarian follicles (> 4 mm); (4) oviductal eggs. Females were reproductively active from April into July. Mean clutch size for 13 females was 4.6 ± 1.3 SD, range = 2-7. There was no indication (oviductal eggs and concurrent yolk deposition) in the same female to suggest *C. texanus* produced more than one clutch of eggs in the same reproductive season. A linear regression analysis revealed a significant positive correlation between female body size, SVL and clutch size for 13 *C. texanus* females. This is shown by the regression equation: Y = -8.30 + 0.2131X, $r = 0.73$, $P = 0.004$. The smallest reproductively active *C. texanus* female measured 48 mm SVL (oviductal eggs present) and was from July (LACM 95292). One female from May (LACM 133183) that measured 47 mm SVL exhibited quiescent ovaries and may have produced eggs later in the reproductive season. I considered a slightly smaller female (SVL = 45 mm) from May (LACM 4247) as a subadult although, conceivably, it may also have produced eggs late in the reproductive season.

Discussion

Fitch (1985) reported a reduction of *C. texanus* clutch sizes in the relatively dry climate of the western portion of its range. This was exemplified by mean clutches of 5.0 and 6.1 from eastern and central Texas, respectively versus 3.6 from southern Arizona. Other data suggesting *C. texanus* produces smaller clutch sizes in the west is in Ballinger et al. (1972) who reported a mean clutch size of 6 for *C. texanus* females from West Texas (San Angelo) versus Hulse (1973) who reported a mean clutch size of 2.8 (Fort Apache Indian Reservation) in east central Arizona. Other mean clutch sizes for *C. texanus* are in Smith et al. (1987). The range of *C. texanus* clutch sizes reported herein (2-7) is within that reported by others: (Cagle, 1950; Stebbins, 1954, 2003; Brennan and Holycross, 2005; Howland, 2009). Because clutch sizes of *C. texanus* decrease later in the reproductive season (Howland, 1992; Punzo, 2007), one should consider the monthly distribution of clutches when calculating mean clutch size.

While there are numerous reports of *C. texanus* females producing multiple egg clutches in the same reproductive season (Cagle, 1950; Johnson, 1960; Ballinger et al., 1972; Vitt, 1977; Fitch, 1985; Howland, 1992). My failure to verify this may have resulted from my small sample of *C. texanus* females (n = 36).

The minimal size at which *C. texanus* males commence reproduction has been reported as about 50 mm SVL by Ballinger et al. (1972). My data indicate *C. texanus* males commence reproduction at 48 mm SVL in New Mexico.

The duration of the reproductive season of *C. texanus* is variable as in Texas, Ballinger et al. (1972) reported it to extend from early April to mid-August, Johnson, (1960) reported females with oviductal eggs in mid-April whereas Howland (1992) reported reproduction probably began the middle of May. Variations in precipitation influenced timing of the reproductive cycle in females of *Sceloporus occidentalis* from California (Goldberg, 1975a). This phenomenon likely also occurs in *C. texanus*. My data indicate that in New Mexico *C. texanus* reproduction commences in April and terminates in August as it seems likely that some of the July females with enlarged follicles (Table 2) would have deposited eggs in August. However there is an increased probability that late in the reproductive season, vitellogenic follicles will not complete development (see Goldberg 1975b).

In conclusion, the timing of the *C. texanus* reproductive cycle is similar to that of many temperate zone lizards in breeding during spring followed by egg deposition in late spring to early summer and young appearing in summer into early autumn

(Fitch, 1970). Additional investigations are warranted to ascertain the amount of geographic variation in clutch size and to test the statement of Fitch (1985), that smaller *C. texanus* clutch sizes in the western part of its range may be associated with lower amounts of precipitation.

Acknowledgment

I thank G. Pauly (LACM) for permission to examine *C. texanus*.

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Appendix

Specimens of *Cophosaurus texanus* from New Mexico (by county) examined from the herpetology collection of the Natural History Museum of Los Angeles County (LACM).
Chavez: LACM 4229; **Doña Ana**: LACM 4214, 4217, 4218, 4216, 4220-4222, 4224, 4226, 4227, 95291-95294, 113398-113401, 113403-113405, 113408, 113415, 123337, 123338, 127510, 133183-133190, 133192-133194, 133197-133201; **Hidalgo**: LACM 62135; **Luna**: LACM 95295, 95297, 95299, 95301, 95303, 95304, 95306, 181881-181891; **Otero**: LACM 23340; **Sierra**: LACM 4230, 4233-4235, 4237-4240, 4242, 4243, 4245-4249, 95307-95309, 95312, 95313; **Socorro**: LACM 23327, 23330, 23331, 23336, 23337, 23339, 23342, 23347, 23351, 23352, 23354, 23356, 23358, 23365, 23373-23375, 23392, 132180, 132184-132186.

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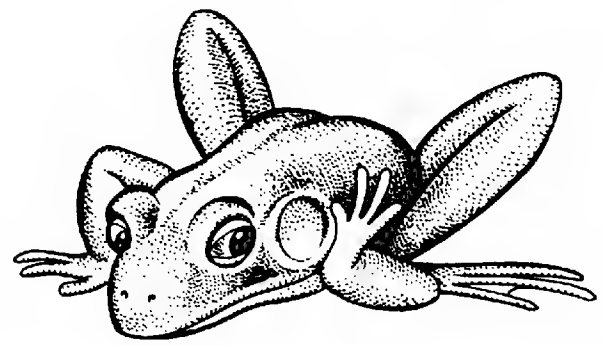
The Tympanum

On behalf of the Mabuwaya Foundation and the Gladys Porter Zoo, which coordinates support within the U.S. for its incredible work for the *in situ* conservation of Philippine crocodiles, I would like to thank the Chicago Herpetological Society for its generous donation of $1,000.00.



The endemic Philippine crocodile, *Crocodylus mindorensis*, is a critically endangered species with an estimated wild population of less than 250 mature individuals. The only two viable populations are believed to survive in Southwest Mindanao and Northern Luzon. The Philippine crocodile is threatened by a combination of hunting and habitat loss. Although nationally protected, environmental law enforcement is weak and there is little public support for crocodile conservation.

There are only two *in situ* conservation programs for Philippine crocodiles—one on central Mindanao Island, which is very difficult to access because of ongoing civil disturbances and security threats, and one on northern Luzon Island. The issues in Mindanao make the north Luzon program the most important for securing this species in the wild—hence, it is globally significant.

Since 1999, the Mabuwaya Foundation (*Mabuhay* = Long live, *Buwaya* = the crocodile) has been implementing a community-based Philippine crocodile conservation project in the municipality of San Mariano, Isabela Province, Northern Luzon. Here, local communities are now involved in the protection of wetlands and crocodiles. This has led to an increase of the crocodile population in San Mariano from 12 non-hatchling individuals in 2000 to at least 54 in 2012 including a minimum count of nine adults. Five nests successfully hatched in the wild in 2012. Crocodiles and their habitat are locally protected in four village and municipal crocodile sanctuaries.

With this success, a new issue has logically emerged. Human-crocodile conflict is occurring as the result of the expanding crocodile population. Even in areas where the Mabuwaya Foundation has conducted campaigns for over ten years and the communities had developed a high rate of acceptance for the presence of crocodiles, once a pig, chicken or dog is predated by a crocodile, that rate of acceptance drops dramatically. Accordingly, the Foundation is working to reduce threats to and from the expanding population of crocodiles in the recovery areas of Dibuluan, Disulap, San Jose and Cadsalan, as well as the four neighboring villages (called *barangays*) where crocodiles are being reported.

I am sure the funds you have sent will be used for some aspect of their current effort to reduce human/crocodile conflict in the areas where the crocs are making a comeback—all thanks to their tenacious efforts.

Once again, we greatly appreciate your support. Kindly extend our gratitude to all of vour contributing members and benefactors. **Colette Adams, General Curator, Gladys Porter Zoo, 500 Ringgold Street, Brownsville TX 78520.**

Bull. Chicago Herp. Soc. 48(3):43-44, 2013

What You Missed at the February Meeting

John Archer
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Most of the time I'm easily distracted. Well, I should write that most of the time when I'm reading or studying I'm easily distracted. I have been known to concentrate when I'm into a particular task, but studying almost always finds me chasing tangents that take me far from the target of my initial inquiries. That tendency often frustrates the editor of your *Bulletin* because it usually means that I don't get my article to him as soon as he'd like. The internet has certainly aggravated this failing, and it is a failing. I'd be much smarter if I would learn about one subject before my short attention span led me to another topic of interest, but as I listen once again to the recording of one of our presenters, I'm lured into side trips that have no use to Mr. Dloogatch or you, probably. Where is that town? How much detail can I see of White Sands on Google Earth? I have to read that paper I missed in *Herpetological Review*. What does *Eurycea cirrigera* look like again? And how does one tell a Durango mountain kingsnake from a gray-banded kingsnake?

Dusty Rhoads admiring Steve Sullivan's trans-Pecos ratsnake. Photograph by Dick Buchholz.

The majority of which information I'll probably forget within a few weeks or months.

So I'm not like Dusty Rhoads, our February speaker. Dusty wrote a book—a book about trans-Pecos ratsnakes—while he was in college (my college accomplishments: I graduated—barely). Dusty can focus, and that fact has given the world a very complete book about *Bogertophis subocularis* and provided your society an expert speaker on the same. And he's another nice guy. I understand that all of our speakers are vetted so that we only invite the finest, but why do they all have to also be amiable companions? Can I not have one small sop that would boost my ego a little? What's wrong with being able every once in awhile to praise a speaker's presentation and intelligence while secretly allowing me to mull, "Yeah, but he's a jerk"? Never happened. Probably never will.

Certainly not with Dusty Rhoads, who, in spite of a persistent cough, arriving a day late because of Chicago's wonderful winter weather, and barely having time to catch his breath before his flight out the next morning, was gracious, humble, and willing to share pizza and libations after the meeting. Dusty is a native of Texas and graduated from Brigham Young University with a Bachelor of Science in Integrative Biology. He's been a research assistant, curatorial assistant, teaching assistant, and educational presenter at a zoo before heading to the University of Mississippi as a graduate student. He's had to interrupt that, but I'm pretty sure that Dusty will wind up completing graduate work, probably aimed at his favorite species. His presentation was titled "Trans-Pecos Ratsnakes and the Value of Herping and Herpers." He started with photos of himself the day his book arrived from the publisher. After five years and much facial hair, he looks a bit more mature, but those photos ably illustrated the amount of zeal that Dustin can bring to endeavors that engage him. He showed a short video of eminent biologist E. O. Wilson talking about the two basic paths that most biologists navigate: either addressing a fundamental problem of biology and finding a particularly apt taxon as a model to solve that problem, or selecting a particular taxon and discovering problems that a study of that taxon may solve. Dusty pointed out that he came to the science the second way—via his enthusiasm for subocs—and emphasized that his interest in that group and his attempt to collect all knowledge on subocs allowed him "intellectual ownership" of subocs and encouraged his pursuit of questions raised by his discoveries.

Dusty classified subocs in the family Colubridae, subfamily Colubrinae, tribe Lampropeltini, and genus *Bogertophis* with recent DNA studies maintaining both *B. subocularis* and *B. rosaliae*, the Baja California ratsnake, as species in *Bogertophis*. With pictures and diagrams Dusty led us through some of the turbulent taxonomic history of these snakes, including all the common names that his research uncovered. My favorite was "a damn Chicken Snake." He highlighted the uniqueness of subocs by pointing out the extra two and four chromosomal numbers that snakes in that genus have as opposed to the 36 diploid chromosomes common to almost all other snakes. Other barriers to hybridization with others in the Lampropeltini tribe reinforce the status of subocs as being very distinct species. Then we saw a series of time maps that demonstrated a possible explanation for the split between *B. subocularis* and *B. rosaliae*. We watched as beginning 15 mya the Baja peninsula split from North America and the local climate changed, isolating two populations that proba-

One of the most attractive snakes on the planet. Photograph by Gerold Merker.

The "not-your-typical-ratsnake-habitat" habitat of subocs. Photograph by Dustin Rhoads.

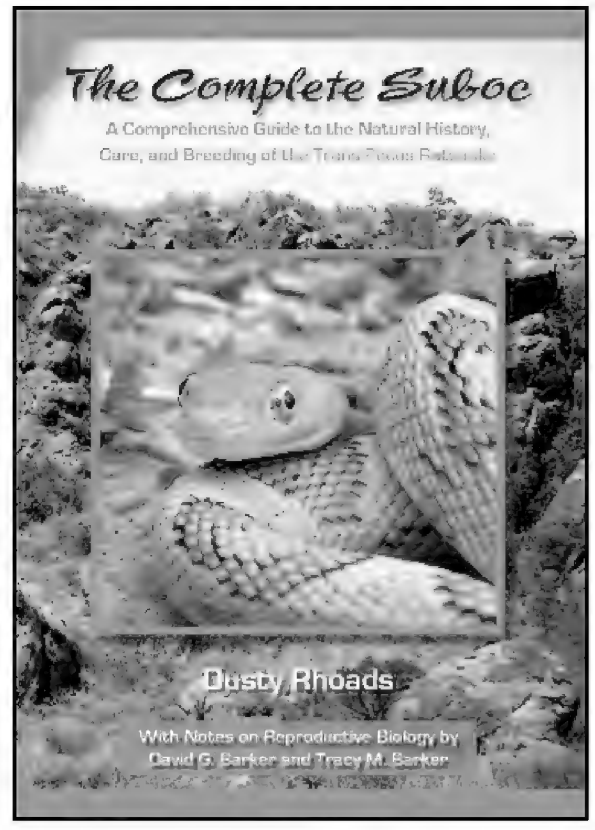
bly evolved into the two species existing today.

Dusty then explained what makes desert ratsnakes special, beginning with a nice close-up of this attractive snake, which showed the subocular scales, the characteristic that Dusty says gives these snakes more of a face than other snakes. Those subocular scales gave *B. subocularis* its scientific name, but the huge bug-eyes and pseudo-eyeshine contribute to their special status in many peoples' eyes. The loaf-of-bread cross section is the characteristic that likely resulted in these snakes being labeled ratsnakes. *B. rosaliae* is more diurnal, with a narrower snout and more forward-facing eyes than the predominantly nocturnal *B. subocularis*, which has a record length of 66 inches. We saw a photo of a 65¾-inch specimen that, unfortunately, was found DOR in west Texas. Multiple slides showed us the similarities and differences between the two species.

Shots of arid, saxicolous (I really like that word), and vertical habitat highlighted domain that isn't the haunt of your true ratsnakes. Subocs are found on rocky slopes and hillsides between 1500 and 5000 feet, and, of course, primarily at night. During the day they are fossorial. We saw an interesting shot of the specialist ticks that parasitize these snakes only. Even in the wild these snakes are usually mild mannered. Dusty had shots of a discovery he made of a suboc foraging on bats by hanging through a hole in the middle of a bridge. Interesting to contemplate how the snake learned to hunt in that manner.

It even looks cute with its mouth full. Photograph by Robert "Steve" Cox.

Good husbandry for these animals is an imitation of their habitat in the wild. A microhabitat that is dark and damp and a macrohabitat that is dry and well ventilated can be recreated with a well vented sweater box and a hide box filled with sphagnum moss. A temperature gradient is always needed. Dusty says that the snakes respond well to naturalistic enclosures with rock walls as background and live plants as accents. We saw pictures of his homemade vivarium and a shot of a larger display at the Houston Zoo.


The Complete Suboc
A Comprehensive Guide to the Natural History,
Dusty Rhoads
With Notes on Reproductive Biology by
David G. Barker and Tracy M. Barker

With a slide of his book cover showing, Dusty joked that captive breeding of these animals was way too complicated to cover in his talk and everyone interested should buy his book. If you're going to breed subocs that's good advice, but Dusty did give us a brief overview. Several photos demonstrated all too well that males are very aggressive during breeding, even scarring females. Clutch size will range from 3 to 15 eggs and smaller females tend to have elongate eggs while larger ones tend to carry rounder eggs. Dusty gave the audience an idea of what may result from captive breeding with a series of photos of morphs not only from breeders' efforts but several variations found in the wild. It was just a pleasure to look at the many colorful variations in these attractive animals.

This segued nicely into what Dusty would like to pursue in research. It seems that recessive traits manage to survive and continually manifest in populations of this animal. Dusty would like to pursue the genetic basis for these variations and explore the effect of habitat on these exhibited morphological differences. Satellite maps showed the correlation between color phases and terrain with the label of "Phylogeography—are there multiple populations, and what are they?" This is when he elected to explain the sub title of his presentation. When Dusty sought tissue samples with site data from museums, zoos, and other professional institutions he received eight. When he asked the amateur herpers for shed skins from animals for which they had GPS data, he received about four dozen. Dusty is happy to have the specimens he needs to pursue his research, but the larger point he wanted to emphasize is we amateurs can have a significant impact on the progress of science. Keeping good records and collecting road kills can help a future investigator.

Dusty ended his presentation with plea for more research into species other than *Homo sapiens*, specifically reptiles and amphibians. I'm sure that all of us feel the same, and I'm glad that there are researchers such as Dusty Rhoads with the curiosity, enthusiasm, and drive to contribute, and the willingness to allow us a view of his results.

Herpetology 2013

In this column the editorial staff presents short abstracts of herpetological articles we have found of interest. This is not an attempt to summarize all of the research papers being published; it is an attempt to increase the reader's awareness of what herpetologists have been doing and publishing. The editor assumes full responsibility for any errors or misleading statements.

SONOYTA MUD TURTLES IN ARIZONA

J. D. Riedle et al. [2012, Chelonian Conservation and Biology 11(2):182-189] note that the Sonoyta mud turtle (*Kinosternon sonoriense longifemorale*) is a member of the unique desert riparian fauna isolated along the Rio Sonoyta watershed in northern Sonora, Mexico, and southern Arizona. This subspecies occupies six sites along the Rio Sonoyta, a pool at Quitovac in Sonora, and one pond at Quitobaquito Springs in Organ Pipe Cactus National Monument in Arizona. Since the mid-1980s, population estimates for the US population have ranged from 39 to 153 individuals. In 2006–2007, the human-made Quitobaquito Pond began losing water, and discussions were held concerning the fate of the turtles. During three salvage efforts all Sonoyta mud turtles encountered were captured and transported to temporary holding facilities. Because the minimum number of turtles needed for re-establishment was unknown, a Population Viability Analysis (PVA) was conducted to determine the number of Sonoyta mud turtles that should be held in an assurance colony. Results from both the PVA and previous work suggested that juvenile survivorship has the strongest effect on female transition rates from nonreproductive to reproductive age classes and in turn population growth; thus, a wide range of age classes should be maintained in an assurance colony.

RAPID REPRODUCTIVE ISOLATION IN *UTA*

A. Corl et al. [2012, Copeia 2012(4):593-602] note that determining the factors that give rise to reproductive isolation is critical for understanding how species form. Observing reproductive isolation between closely related populations is especially interesting because it can show the factors initially involved in species formation. The authors studied two phenotypically different populations of side-blotched lizards (*Uta stansburiana*), which diverged less than 22,500 years ago according to geologic evidence. The lava flow population has dark dorsal coloration for crypsis and is dimorphic for throat coloration used for signaling male mating type. The off-lava population has light dorsal coloration and is trimorphic for throat coloration. The authors tested whether there was reproductive isolation between these two populations in order to understand the factors that maintain the phenotypic differences between them. Genetic crosses revealed evidence of reproductive incompatibilities because females from the dimorphic lava population produced fewer fertilized eggs and more unfertilized eggs when mated outside their population. In addition, male morphs varied in their reproductive compatibility because females from both populations produced fewer fertilized eggs and fewer clutches with orange-throated males from outside their population. The reproductive incompatibilities observed between the populations suggest that cryptic female choice of sperm may act as a post-mating, prezygotic barrier that contributes to the rapid formation of new species.

PREGNANT RATTLESNAKES CONTINUE TO FEED

G. W. Schuett et al. [2013, J. Zoology 289(2):101-110] note that for various reasons, reduction or cessation of feeding (anorexia) can occur in either sex during periods of reproduction among vertebrates, from cichlids to elephant seals. Anorexia is commonly associated with gestation in snakes. Using radiotelemetry, the authors investigated the feeding and spatial ecology of western diamond-backed rattlesnakes (*Crotalus atrox*), a live-bearing viperid species. Specifically, from 2001 to 2010, they determined the feeding frequency and home range size of adult females (n = 27) during the active season (March–October) in a population from the Sonoran Desert of Arizona. The central hypothesis addressed was: Do hunting and feeding occur throughout pregnancy? Also tested was a corollary hypothesis: Does pregnancy influence home range size? Hunting and feeding were documented from March to October and during pregnancy (June to mid-September). Feeding frequency was significantly greater in late pregnancy, a result that is in sharp contrast to most other large-bodied vipers. Furthermore, home range sizes in gestating subjects did not differ from those in nonreproductive years. Births occurred from mid-August to mid-September and mean litter size was 3.4. Frequent feeding in *C. atrox* during gestation unquestionably provides energy and nutrients to the mother, which is likely important for survival, but such food consumption does not imply that nutrients are used by the fetuses. There is, however, recent evidence in other snakes, including a pitviper, that amino acids are transferred to fetuses. Feeding during pregnancy in *C. atrox* may be important for both income and capital mode reproduction. Hunting and feeding throughout gestation might be accomplished by having relatively small litters not burdened by a body cavity filled with fetuses. Reduction in litter size may thus be a life-history (fecundity) trade-off that permits females to survive and maintain pregnancy in regions where drought and high temperatures are often extreme and chronic.

DISPERSAL OF HATCHLING WHIPSNAKES

L. Rugiero et al. [2012, The Herpetological Journal 22(4): 259-261] investigated dispersal patterns of hatchlings from a communal nesting/birth site in central Italy of the western whipsnake, *Hierophis viridiflavus*, using capture-mark-recapture data from a 17-year study. Hatchlings lighter at birth dispersed more than heavier ones, whereas after one year there was no difference in body mass between the individuals that remained close to their birth site and those that dispersed further. The authors interpret this result as an adaptive dispersal behavior in which heavier newborn snakes are less inclined to disperse from the hatching site, whereas lighter snakes move further away to increase their foraging efficiency.

Unofficial Minutes of the CHS Board Meeting, February 15, 2013

The meeting was called to order at 7:38 P.M. at the Schaumburg Public Library. Board members Josh Baity, Lawrence Huddleston and Cindy Rampacek were absent.

Officers' Reports

Recording Secretary: The January 18, 2013, minutes were read and accepted.

Treasurer: The January financial report was presented, discussed, and accepted. We need to start thinking about options for a new treasurer next year, if Andy Malawy retires..

Membership Secretary: Holding steady. Mike read a list of expiring memberships.

Corresponding Secretary: Stephanie has purchased a new phone.

Publications Secretary: Aaron is working on the website.

Sergeant-at-arms: Jim Foster reported that January's meeting attendance was 38.

Committee Reports

Shows:
- Notebaert Nature Museum, first full weekend of each month.
- Kids Expo, Schaumburg Convention Center, March 9–10
- Reptile Rampage, Lake Forest, March 10
- Chicagoland Family Pet Expo, Arlington Park Racecourse, March 15–17, 2013.
- NARBC, Tinley Park, March 16–17

Old Business

Junior Herpers club: JH wanted cards to hand out at events. Jenny moved to order 2000 cards. Stephanie seconded. After discussion, the quantity was increased to 5000. Motion passed unanimously. Stephanie moved to order JH shirts to be sold to members. The order will be added to the 'Fest shirt order. Jenny seconded. The motion passed unanimously.

New computer/projector/microphone: Teresa Savino had info on several refurbished computers, but after discussion, it was decided to look at new. Aaron LaForge is looking into the projector. Mike Dloogatch moved to purchase a microphone system. Aaron seconded. Motion passed with Linda Malawy abstaining.

New Business

MHS and IHS: The board discussed ways to improve CHS representation at the Midwest Herpetological Symposium in Peoria, 8/30–9/2, and the International Herpetological Symposium in New Orleans, 7/31–8/3.

Attendance at meetings: The board discussed means of increasing attendance at general meetings. To be continued.

Grants: The committee awarded 8 grants totaling $7000. Mike Dloogatch moved to allocate $7000 for the 2013 grants. Jim Foster seconded, motion passed unanimously.

Round Table

John took animals to Chicago Animal Care and Control for Bob Bavirsha and met interesting people. Bob was missed.

Dick Buchholz had a snake stolen at the Great Lakes Pet Expo. It was recovered after the event.

The meeting was adjourned at 9:43 P.M.

Respectfully submitted by recording secretary Jenny Vollman

International Herpetological Symposium
July 31 to August 3, 2013
New Orleans, Louisiana

The IHS provides a yearly symposium for the dissemination of information and research pertaining to the natural history, conservation biology, captive management, and propagation of amphibians and reptiles. We hope you will join us for this very exciting meeting in New Orleans.

For more information: www.internationalherpetologicalsymposium.com

Advertisements

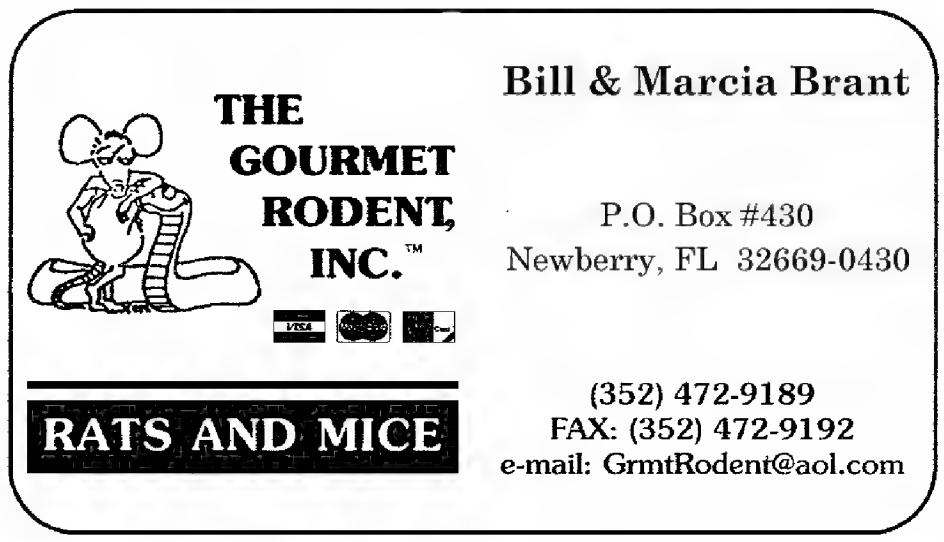
For sale: rats and mice—pinkies, fuzzies and adults. Quantity discounts. Please send a SASE for pricelist or call Bill Brant, *THE GOURMET RODENT*, PO Box 430, Newberry, FL 32669-0430, 352-472-9189, E-mail: GrmtRodent@aol.com.

For sale: **highest quality frozen rodents**. I have been raising rodents for over 30 years and can supply you with the highest quality mice available in the U.S. These are always exceptionally clean and healthy with no urine odor or mixed in bedding. I feed these to my own reptile collection exclusively and so make sure they are the best available. All rodents are produced from my personal breeding colony and are fed exceptional high protein, low fat rodent diets; no dog food is ever used. Additionally, all mice are flash frozen and are separate in the bag, not frozen together. I also have ultra low shipping prices to most areas of the U.S. and can beat others shipping prices considerably. I specialize in the smaller mice sizes and currently have the following four sizes available: Small pink mice (1 day old—1 gm) , $25 /100; Large pink mice (4 to 5 days old—2 to 3 gm), $27.50 /100; Small fuzzy mice (7 to 8 days old—5 to 6 gm) , $30/100; Large fuzzy mice / hoppers (10 to 12 days old—8 to 10 gm), $35/100 Contact Kelly Haller at 785-234-3358 or by e-mail at kelhal56@hotmail.com

For sale: High quality, all locally captive-hatched tortoises, all bred and hatched here in the upper midwest. Baby leopards, Sri Lankan stars, and pancakes usually available, and are all well-started and feeding great! Leopards are $125 ea., Sri Lankans (2012 hatched) $475 ea. And Pancakes are $195 ea. Leopards for out of state sale/shipping require a veterinary health certificate (inquire for cost). E-mail at KKranz1@wi.rr.com or call Jim or Kirsten at 262 654 6303.

Herp tours: **Costa Rica herping adventures**. Join a small group of fellow herpers for 7 herp-filled days. We find all types of herps, mammals, birds,and insects, but our target is snakes. We average 52 per trip, and this is our 10th year doing it. If you would like to enjoy finding herps in the wild and sleep in a bed at night with air-conditioning, hot water and only unpack your suitcase once, instead of daily, this is the place to do it. Go to our web-site http://hiss-n-things.com and read the highlights of our trips. Read the statistics of each trip and visit the link showing photos of the 40 different species we have found along the way. E-mail at jim.kavney@gmail.com or call Jim Kavney, 305-664-2881.

Herpetological Researcher/Educator Internships: Research 4 Reptiles, LLC. is seeking two volunteer interns, ages 18 years and older, for the Summer 2013 season to assist in all aspects of herpetological research and educational classes. Our mission is to provide challenging, hands-on, field-based programs for participants ages 12 years and older to inspire enthusiasm for and understanding of native Illinois reptile and amphibian species. All educational programs are taught entirely outdoors at Midewin National Tallgrass Prairie in Wilmington, Illinois, and are limited to 8 participants. Internship details can be found on our website at: http://www.research4reptiles.biz. Email Holly Zak at research4reptiles@comcast.net or call 630-337-0757 for questions.



Line ads in this publication are run free for CHS members—$2 per line for nonmembers. Any ad may be refused at the discretion of the Editor. Submit ads to mdloogatch@chicagoherp.org.

INDIANAPOLIS ZOO TRIP

On Saturday, May 11, 2013, your Chicago Herpetological Society is offering members a behind-the-scenes visit to the Indianapolis Zoo. We will meet at the zoo Saturday morning; no group transportation provided. Fees for parking and admittance apply. Space is limited. The operating hours are 9–5 on Saturday. Go to indyzoo.com for in-depth information regarding the zoo experience. More information will follow; please watch the *Bulletin* and the CHS Facebook page for updates. To reserve space, contact Linda Manchen Malawy at 630-717-9955.

Deserts Biome

The Zoo's overall goal to immerse visitors in the natural habitats of its animals was firmly in mind when designing the Deserts Biome, which opened in 1990. In fact the desert habitat is so authentic, the Zoo is known worldwide for its successful research and breeding of some the rarest desert reptiles. The Indianapolis Zoo was the first zoo in the world to have successfully bred the extremely endangered Grand Cayman blue iguana and the only zoo to successfully breed the rare Jamaican iguana. The attention to detail in the Deserts Biome sets it apart from other desert exhibits across the nation. The 80-foot diameter transparent dome allows the animals to bask in natural sunlight year-round while heating and air conditioning vents hidden in the rocks keep the temperature in the 80s.

Zoo staff spent two weeks in Tucson, Arizona, making rubber molds of actual rocks that decorate the Deserts Biome. The granite gravel lining the floor of the exhibit was trucked in from Arizona, and the giant rocks were painted to match the color of the gravel. The rocks are situated to form a canyon and river and to sculpt a walkway through the dome for visitors. Larger animals are behind glass in the exhibit areas, but the birds and smaller lizards roam freely throughout the dome. If a lizard finds itself in the middle of a turf battle or being pursued by a rambunctious young visitor, it can take cover in one of 75 "hide tubes" throughout the dome. The tubes are made of drainage piping built into the rocks and lined with gravel to provide traction.

About 250 species of plants flourish in the biome, several of which are endangered. Planters constructed inside the rocks give the appearance that the plants grow from within the terrain. All of the plants in the biome are living and cared for daily by the horticulture staff. The temperature in the deserts dome is regulated at 85° in the summer and 82° in the winter. It is lowered to simulate a seasonal change and encourage some of the animals to maintain their hibernation schedule just as they would in the wild. Some animals, like the endangered desert tortoise, need even lower temperatures to hibernate. For the tortoises' winter nap, keepers settle them into a special refrigerator off exhibit to sleep at a chilly 55° until spring. The Deserts Biome is home for another species of tortoise, the radiated tortoise of Madagascar. In late 1995, the zoo was successful in breeding this endangered tortoise, and many more young tortoises have been born since.

Drop Dead Gorgeous Snakes

Opened in June 2000 inside the Deserts Dome, this permanent exhibit presented by AT&T Advertising Solutions features some of the most gorgeous—and deadly—snakes on the planet. In the "Snakes as Art" gallery, the exhibit includes 13 of the most beautiful snakes in the world highlighted with pinpoint fiber optics as they rest in "jewel box" cases. A curving "habitat wall" highlights a second gallery—a collage of spectacular images showing the many different kinds of snakes and the myriad environments in which they can be found. Visitors may sit on a full-size model of the world's largest snake—a 33-foot long version of a reticulated python with a body fully 16 inches in diameter.

The "Snakes and People" gallery is one of the most important parts of the exhibit where the many myths that surround these creatures are exploded. The focus is on how snakes are cared for in the Zoo and on some of the key research and conservation programs in which zoos throughout the world are engaged, as well as many of the snakes that are found right here in Indiana. As humankind comes more and more into contact with snakes, it is more important than ever to understand that the relationships between snakes and people can be mutually respectful, and even entertaining!

See indyzoo.com for more enticement!

UPCOMING MEETINGS

The next meeting of the Chicago Herpetological Society will be held at 7:30 P.M., Wednesday, March 27, at the Peggy Notebaert Nature Museum, Cannon Drive and Fullerton Parkway, in Chicago. **Gerry Salmon** of Boerne, Texas, will present "Herping the Trans-Pecos: Meyenberg to Sanderson Snakedays." Gerry Salmon has been an avid naturalist for most of his 52 years. He is a former state park naturalist for New York and South Carolina, an associate of the Department of Herpetology at the Bronx Zoo, and worked at the Miami Serpentarium in the early 1980s. He recently retired from a career with the New York State Police. One of Gerry's primary interests is the natural history and diversity of snakes and other herps in the American Southwest and Mexico. His talk is based on more than 25 years of experience in the region and its herpetology.

Speaking at the April 24 meeting will be **Dan Krull** of Shawnee, Kansas. Dan is familiar to many of you as a talk show host for Herp Nation Media.

The regular monthly meetings of the Chicago Herpetological Society take place at Chicago's newest museum—the **Peggy Notebaert Nature Museum**. This beautiful building is at Fullerton Parkway and Cannon Drive, directly across Fullerton from the Lincoln Park Zoo. Meetings are held the last Wednesday of each month, from 7:30 P.M. through 9:30 P.M. Parking is free on Cannon Drive. A plethora of CTA buses stop nearby.

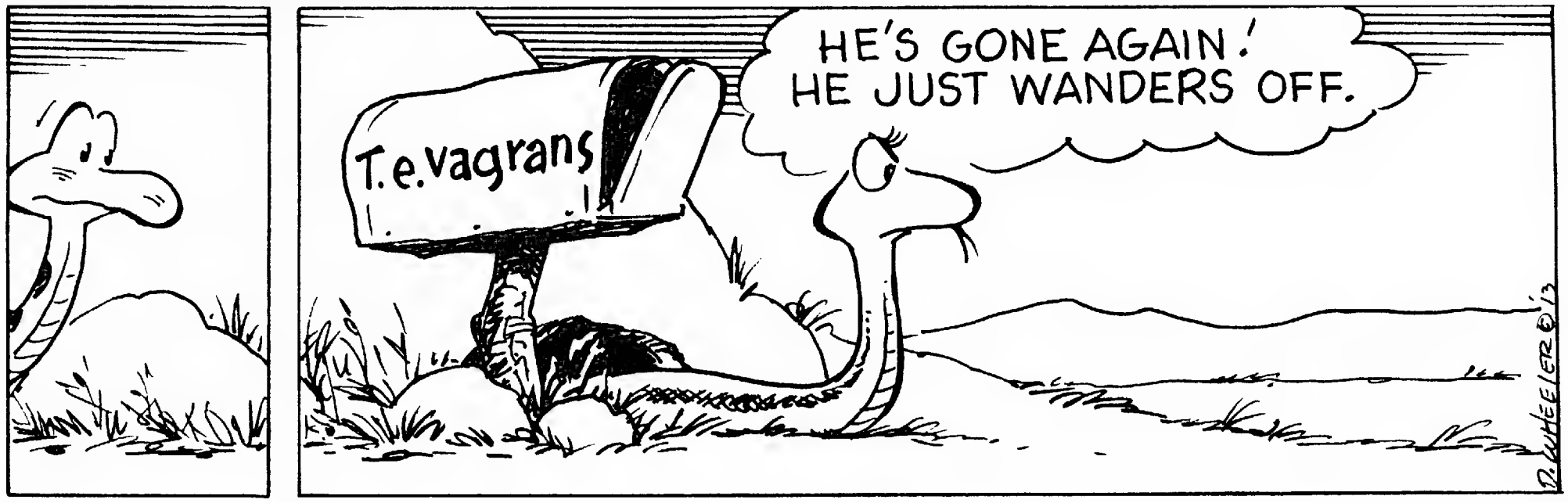
Board of Directors Meeting

Are you interested in how the decisions are made that determine how the Chicago Herpetological Society runs? And would you like to have input into those decisions? If so, mark your calendar for the next board meeting, to be held at 7:30 P.M., May 17 (no April board meeting because of ReptileFest), in the adult meeting room on the second floor of the Schaumburg Township District Library, 130 S. Roselle Road, Schaumburg..

The Chicago Turtle Club

The monthly meetings of the Chicago Turtle Club are informal; questions, children and animals are welcome. Meetings normally take place at the North Park Village Nature Center, 5801 N. Pulaski, in Chicago. Parking is free. For more info visit the group's Facebook page.

THE ADVENTURES OF SPOT



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Serendipitous Sightings of *Pseudemys* in Southern Illinois . . . . . John G. Palis 49

Book Review: *Thirty Seconds before Midnight* by Helen J. Beal . . . . . David S. Lee 52

Frog City: IV. Mom's Minks . . . . . Ilene Sievert 53

What You Missed at the March Meeting . . . . . John Archer 56

Herpetology 2013 59

Unofficial Minutes of the CHS Board Meeting, March 15, 2013 62

Advertisements 63

News and Announcements: Indianapolis Zoo Trip 64

Cover: Adult male river cooter, *Pseudemys concinna*, carapace length 25.0 cm. Photographed in Johnson County, Illinois, on 23 May 2003 by John Palis.

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The Chicago Herpetological Society is a nonprofit organization incorporated under the laws of the state of Illinois. Its purposes are education, conservation and the advancement of herpetology. Meetings are announced in this publication, and are normally held at 7:30 P.M., the last Wednesday of each month.

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Serendipitous Sightings of *Pseudemys* in Southern Illinois

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Serendipity, as defined by the Oxford American Dictionary, is "the making of pleasant discoveries by accident" (Ehrlich et al., 1980). Herein I describe my two serendipitous encounters, nearly 10 years apart, with river cooters (*Pseudemys concinna*) in southern Illinois.

The river cooter is a large emydid turtle attaining a carapace length of up to 37.5 cm (Conant and Collins, 1991), with the largest Illinois specimen measuring32 cm long (Phillips et al., 1999). It is a southern species, inhabiting large rivers, their tributaries and backwaters, from eastern Texas, Oklahoma, and southeastern Kansas eastward to Georgia, the Carolinas and Virginia.

River cooters were first reported from Illinois by Garman (1890). Apparently never common in Illinois (Garman, 1892), the species was once thought to be extirpated from the state (Morris et al., 1983). However, results of focused surveys by Don Moll in the late 1980s, combined with incidental sightings, verified the continued existence of river cooters in Illinois (Moll and Morris, 1991). Most recent sightings have been in floodplain lakes and ponds of the Ohio and Wabash River systems of southeastern Illinois (Dreslik, 1997, 1998; Dreslik et al., 2003; Moll and Morris, 1991; Readel and Phillips, 2008). Sightings in the Mississippi River drainage are much less common, and for several counties, are many decades old (Phillips et al., 1999). Due to its scarcity and human modification of its habitat, the river cooter it is listed as Endangered in Illinois (Phillips et al., 1999).

Sighting #1

Every spring from 2001 through 2004, I studied amphibian and reptile usage of three recently constructed wetlands on The Nature Conservancy's Grassy Slough Preserve near Belknap, in Johnson County (Palis, 2007). I sampled the herpetofauna using a variety of techniques including funnel-trapping at drift fences, coverboard sampling, visual encounter surveys, nocturnal frog-call surveys, and hoop net trapping (for turtles). I also kept tally of species encountered incidental to survey activities, such as those encountered while going from one wetland to another.

On 23 May 2003, I spent a lovely morning checking funnel traps and coverboards at all three wetlands. Captures were few, consisting of a half dozen cricket frogs (*Acris crepitans*), a juvenile cottonmouth (*Agkistrodon piscivorus*), and an adult black racer (*Coluber constrictor*). During the afternoon, I conducted visual encounter surveys of two wetlands. Wetland visual encounter surveys consisted of walking and wading for two hours along the shoreline and in near-shore waters, dipnet in hand and binoculars hanging from my neck, recording the number of individuals of each herpetofaunal species I encountered. Wetland surveys yielded sightings of hundreds of frogs and tadpoles, a single small-mouthed salamander (*Ambystoma texanum*), several red-eared sliders (*Trachemys scripta*) and painted turtles (*Chrysemys picta*), and three copperbelly water-snakes (*Nerodia erythrogaster neglecta*). After completing my survey of the second wetland, I strolled back towards my car on the sparsely vegetated ground below the long, low earthen dam. At 1730 h, I walked up on a large emydid turtle, motionless and oriented towards the wetland. As I passed by I made a mental note, "female red-eared slider." Something about this turtle, however, gave me pause; the claws on the front feet were extremely long. Long foreclaws are indicative of mature male red-eared sliders who use them to titillate females during courtship. But male red-ears don't get as large as this turtle. I closely examined the turtle and realized I had discovered an adult male river cooter!

Aware of its imperiled status in the state, I documented my find with photographs. And, upon checking the range map for the river cooter in the *Field Guide to Amphibians and Reptiles of Illinois* (Phillips et al., 1999), I discovered that this turtle represented a new county record.

This sighting was extremely fortuitous. The preserve is 1123 hectares in extent (including 15 constructed wetlands) and bisected from north to south by an approximately 4.5-kilometer-long channelized stretch of the Cache River. The turtle was approximately 130 m from the river at a wetland that, until 1999, was a manicured, plastic-covered field used to grow vegetables on a large, commercial scale. The turtle and I just happened to be at the same spot, at the same time, on the same day; certainly an improbable set of circumstances. One wonders why the turtle climbed the steep clay-mud bank of the deeply-incised Cache River and wandered eastward through a field of weeds. He certainly could not have seen the wetland perched high above the river and hidden behind the earthen berm. Did he know the wetland was there, and if so, what sense(s) did he employ to detect its presence?

Adult male river cooter, *Pseudemys concinna*. Photographed in Johnson County, Illinois, on 23 May 2003 by John Palis.

Sighting #2

Thursday, 7 February 2013 was an unseasonably warm winter day. Under a cloudless sky the air warmed to the low 60s (°F) by late morning. Winter days like these compel me outdoors. I decided to go to Horseshoe Lake in the afternoon to see if snakes were emerging from hibernation. However, as morning rolled into afternoon, the sky became progressively cloudier. Change of plans. Instead, I went to Trail of Tears State Forest, in Union County, to walk the floodplain of Clear Creek, upstream of State Forest Road. I had hoped to find floodplain pools that could be used as breeding sites by amphibians. But I was to make an even more amazing discovery.

When I first arrived at the creek, I scanned for turtles with my binoculars. I saw four adult red-eared sliders, one on a log and three on the steep, west bank. Like the Cache River, the downstream reach of Clear Creek has been channelized and transformed into a steep-sided ditch. Here, the water usually runs brown with silt; but on this day, due to little rainfall, deep water was emerald blue-green and shallow water was clear enough to see the bottom.

As I meandered upstream, periodically scanning the creek for basking turtles, I heard multiple skeins of snow geese as they flew overhead, carried northward by a warm south wind. At 1430 h, nearly 0.6 km upstream of the bridge, I spied a forked log, midstream, adorned with five basking turtles. Viewing them at a distance through my binoculars, I noticed one exceptionally large individual. To prevent disturbing them, I slowly moved closer, keeping trees between myself and the turtles. When close enough, I got on my belly and crawled toward the top of the bank. I slowly raised my head, then my binoculars . . . the big turtle was a river cooter! Like my previous sighting, this one bore the long foreclaws of a male. Because the water was not carrying a load of silt, the turtles were clean, and their colors and patterns were discernible. Unlike the melanistic adult male red-eared slider he lay behind, the cooter was quite colorful. He had multiple narrow, yellow, longitudinal head and neck stripes, and orange-yellow vertical bars on the marginal scutes of the carapace. Although not particularly clear, I could also see fine, irregular lines on the larger scutes of carapace. There was no doubt I was looking at a river cooter. But how do I document it? I pulled out a little, point-and-shoot digital camera and captured an image that included both banks of the creek, the creek itself, and small objects (i.e., the turtles) on the log. Not satisfied, I crawled away from the bank and then slowly made my way to a large bankside tree closer to the basking turtles. Reaching around the tree, I pointed the camera and captured a couple more images, of similar, unsatisfactory quality as the first.

Excited by my find, I continued my upstream trek to look for more turtles. The floodplain soon disappeared and I found myself struggling to stay vertical as I carefully traversed a steep talus slope that dropped down into Clear Creek. I could not have negotiated the steep slope, with its loose rocks, wet leaves, and mosses, if not for tree and shrub handholds upon which I entrusted my life. The steep slope yielded a beautiful zigzag salamander (*Plethodon dorsalis*) that was exposed during an unplanned slide downslope. I subsequently found two more individuals under rocks.

My upstream jaunt yielded 64 more red-eared slider sightings, but no more cooters. I stopped and turned back at approximately 1.2 km north of the bridge. I counted a total of 75 red-eared sliders on my northward trek, nearly all of which were basking. By 1620 h I was back at the cooter log; the cooter and his slider companions had not moved.

I returned to Clear Creek, with a better camera in hand, twice in following days (9 and 11 February). The weather on these subsequent visits was cooler than the day I saw the cooter and the multitude of red-ears. Naturally, now that I was prepared to document its presence, the cooter was a no-show.

My unexpected sighting of a river cooter in Clear Creek is the first for this species in the Mississippi River drainage of Union County since Cahn's (1937) book, *The Turtles of Illinois*. A river cooter was sighted in Union County in 2006, but that turtle was in the Cache River drainage (Chris Phillips, personal communication, 2013). Like my first observation, the Clear Creek sighting was another case of being in the right place at the right time. The right time, in this case, was an especially unlikely time of year to make such an observation—mid-winter.

Interestingly, both river cooters I happened upon were males. Male aquatic turtles are more likely to make long-distance movements and colonize new habitat than females (Morreale et al., 1984; Tuberville et al., 1996). River cooters are no exception; in a study conducted in southeastern Illinois, males moved greater distances than females and one male relocated from one floodplain lake to another (Dreslik et al., 2003).

My chance encounters of river cooters in southern Illinois suggest: 1) that I am prone to stumble upon rare turtles, or 2) the species may not be as rare as generally perceived. I am inclined to accept the latter explanation over the former, and suggest that focused cooter surveys of streams and floodplain ponds and lakes within the Mississippi River drainage of southern Illinois might yield additional observations of this enigmatic turtle.

Acknowledgments

I thank Bob Bluett, Mike Dreslik, and Chris Phillips for kindly sharing pertinent literature and information; Erin Palmer for providing the cameras; and the Illinois chapter of The Nature Conservancy for funding the survey at Grassy Slough Preserve. The Illinois Department of Natural Resources provided permit #96-17S to handle state-listed herpetofauna.

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Book Review: *Thirty Seconds before Midnight* by Helen J. Beal
2012. 247 pp. Carapace Books, London. ISBN-13: 978-1909354012 Hardcover $16.00*

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Okay, this book is fiction, but what the heck it's told through the perspective, of all things, a tortoise and published by a London press calling itself Carapace Books. You should take a look.

Drugs, sex and rock-and-roll, what more could one want in a book? Well let's weave into the storyline Greek mythology, any number of interesting biological concepts, numerous contrasting themes, and the questioning of old adages and the natural order of things. And just to make the story a little richer our lead character is a tortoise called Herbert.

This book is a fun read, as it questions and strengthens our understanding of life, friendships, young love, the importance of family, security, and death by providing alternative thoughts from not just Herbert, but a number of other creatures that share a threatened menagerie of a rundown English estate. The lure of fame, the contrasting promises and fears of anticipated change, and the importance of friendships are each countered with ingrained instincts and a dash of common sense. The human world of options collides with the one of limitations and dependence of those that make up the menagerie. While the evolution of the various creatures, and our personal understanding of how the world works each take time, change is often abrupt, and life, like this epic tale, is about adjustment.

The relative importance of money, status, looks, and knowledge that are brought into question by an intriguing cast of human characters, are at best topics of amusement and confusion to those sharing the confinement of the menagerie—and by the time one finishes the book perhaps its readers as well. In the true tradition of Greek mythology the value and tragedy of life are explained while being simultaneously questioned and tested by rock-and-roll mindsets, and given meaning and purpose through the innate behaviors of the nonhuman cast.

Actually, except for the adult language and situations, this would be a great book for teaching biological concepts (true ones and a few that are otherwise) and responsibility to high school biology classes. And then there is the contrast of our human thought processes to those of more noble creatures.

The book nicely illustrates our limited 30-seconds-worth of understanding world order. For those of us maintaining collections of live reptiles perhaps Herbert can teach us a little about the creatures' total dependence on us, our responsibilities to them, and the mundane routines that they endure. There are take-home messages on nearly every page, and the astute reader will at least learn not to look back and that there is no place like home, even if you have never even been there.

For those of us maintaining assurance colonies of turtles and tortoises our ultimate goal is, of course, for them to get back home, maybe not an option for this generation of captives, but hopefully for their progeny. Still this does not give us license to maintain these creatures for decades in 35-gallon aquariums while we wait for the politics, economics, wildlife regulations, and ethics of developing nations to change. Perhaps this book can put you inside the mind of a tortoise. Most people who keep them eventually come to realize that they are a bit more astute than is generally realized.

Bull. Chicago Herp. Soc. 48(4):53-55, 2013

In fond remembrance of Ilene Sievert, who died December 16, 2012, this year we will reprint several of the essays that Ilene wrote for these pages between 1988 and 1993 under the rubric "Frog City." This one is from August 1989.

Frog City
by Ilene Sievert

IV. Mom's Minks

She sits alone: the companions have preceded her; she, the sole female. Her fat white belly splays from under each arm like the bosom of a stoneage venus. She's a soft down cushion plopped on the flat stone. This blobby shape is not a sign of advanced age. It was thus from maturity. The snowy full belly and throat always distinguished her fair sex from the creamy gold of the males. Above she is mud rimmed with green algae. She is the true frog of the seven plowing oxen in the northern sky, the seven stars of Ursa Major; the boreal frog, *Rana septentrionalis*; in common speech, the mink frog.

Geriatric feeding is done carefully, by hand, to spare stress and, as her aim is none too good, to spare fishing out drowned bugs. As befits her quiet life, food is light in quantity, and also incidently in color, as she gets mostly waxworms and newly shed mealworms. There's an occasional cricket for roughage—she loves them so. Her eyes, once so shining, have a faint frost, sequel of the deadly infection that left her all alone. She's not blind and will strike, though often unsuccessfully, at moving prey from 3–4 inches. How do the years demonstrate? Her inactivity is most noticeable. But perhaps present calm is the product of a previously unknown solitude?

Remarkable for muddiness in a land of deep sands is the aptly named Mosquito River. Many streams have this name but this particular small Mosquito flows to the south shore of Lake Superior. It has fairly lush vegetation, with vines, maples, and other deciduous woody plants in contrast to the pines, birches, and bracken of the humus-starved sand. On a particularly wet July afternoon seven years ago, we turned away from well-drained shore paths and hiked back to our trailhead through the soggy woods of the Mosquito, our eyes on the sun, fearing to be caught out and devoured at dusk. We walked with a neighbor family whose son is the same age as our daughter. The kids were peevish and irritable for lack of something "interesting." Actually, they were probably hungry and somewhat tired though they still danced around like demented grasshoppers. They had dashed to the edge of each precipice and waded the fast stony streams, even the ones that didn't need wading, and possibly the muddy woods and darkening air seemed boring by contrast; no peril presented itself. As we went on, a small puddle appeared here and there. Then larger puddles. Here is interest --- one could get filthy! Off they ran, yelling, towards the largest puddle, followed by the well-ignored lamentation and protest of parents. Here be interjected the Litany of Parent and Child.

Parent: If you wear those old gymshoes hiking you'll hurt your feet!

Child: No I won't.

P: If you run to the edge of the cliff you'll fall off and kill yourself!

C: No I won't.

P: If you jump on those slippery rocks you'll fall in the creek!

C: NIW

P: Gobble up all that food and you'll get a stomach ache!

C: NIW

P: Keep in sight or you'll get lost!

C: NIW

Parent: Come hiking with us today. You'll have a lot of fun!

Child: No, No, No I won't!

The child was correct on all but the last. She did, anyway.

The large muddy puddle erupted in small detonations as the children ran toward it. By the time they arrived the waters were cloudy and rippled. Nothing could be seen. As the kids prepared to wade in and grope around, a timely suggestion was made that instead, we should quietly sneak up to a different puddle about 100 feet down the trail. Nestled in the buggy slime around the little pool were myriads of identical small living clods of mud-colored frog. The flattened posture of the animals signified to me they were well aware of our presence and trusted to camouflage from the quiet and slow moving menace. Some wriggled backward into the mud and achieved partial burial. I slowly dropped down and very slowly reached over to touch one. As I gently touched he leaped cleanly into the water, did a beautiful underwater frog kick 3/4 across the puddle, and settled invisibly into the bottom. Definitely Olympic quality. For trial two, I reached more quickly and roughly to an animal close by. Before my palm swatted him the puddle exploded all over me. No clean dives here. My victim and three or four animals not previously noticed, dived noisily, spraying water and setting off several other groups around the pool. The water was murky with silt in large patches and the divers could not be seen. A hard core of cryptic hiders remained behind.

The kids were delighted and scared off the rest to see the splashing. " Let's catch some frogs!" was the battle-cry, and off they went to scout for another undisturbed puddle. Dear Lord, return to me the speed and sharp sight of childhood. None of the adults could catch a frog by grabbing. We had no nets. The slimy mud and squishy frogs were too much for the old folks. The children combined physical skill with lack of inhibition. They filled a glass jar. My heart sank to see the jar of writhing, suffering victims. After long parley we got down to hard negotiations concerning the prisoners. The other family had already given permission to their son to take some frogs home, so I tried a least-harm strategy. The terms were: release all captives, rinse

the jar, and take only four (4) frogs, two per family. I held little hope for Geoff's two. He had already lost a toad by leaving the lid off the tank, and these creatures seemed more fragile, more likely to escape. His parents did not seem thrilled when told about live food and frequent water changes. Lo and behold, it came to pass that in the week following the camping trip, Geoff had a parrakeet and we had four little frogs.

They settled in remarkably well in a 5-gallon aquarium, 1/2 full, with a corner filter, tight glass cover and stack of flat stones to sit on. My first worry, that injuries would occur from hitting the clear glass was not justified. They never struck themselves when jumping or diving. However, their ravenous appetites were alarming. The appearance of food caused a wild melee. If one had an insect and another did not, the empty frog would strike at the other's face. We installed several feeding rocks to reduce competition. All the rest of that summer they gorged and grew. The 5-gallon was replaced by 10 and then 20. Something exciting happened. Three of the four grew large eardrums and golden throats. Their forearms and thumbs thickened. They started to vocalize. And did they fight! They would rather fight than eat. The face striking and pushing became so frequent, the female cowering at the bottom of the tank, the food drowning and fouling, the water kept continually churning and splashing, that when we were offered an old ironbound 48" long aquarium we rushed to repair and set it up. Lebensraum vs. Armegeddon. A couple of weeks and 5 gallons of aquarium caulk later the deluxe mink frog people's uncooperative commune was ready. The main sitting station was of flagstone stepped to overhang the water and provide several sitting levels. Another smaller station was far across the tank and had an above-water hiding nook. A large twisting piece of Mississippi driftwood threw several loops above and below the water line. A waterfall style filter, finagled to draw from a partially filled tank, poured a weak stream over some large smooth granite pebbles firmly arranged so as to break the splash. Natural pea gravel covered the bottom and hid the sea of repair caulk. We constructed the lid from aluminum angle, screen, and plexiglas. It had a sliding door on each end. A Vitalite fluorescent rested on the middle of the screen. Moss grew and upholstered the driftwood in soft rich green. Guppies were added to pick at waste.

The frogs loved it. Here one could make the long leap. What excellent watermen they were, never hitting an obstacle; diving and swimming surely to their destination. They easily climbed, with streaming flopping flippers, up onto the perches of stone or wood. They climbed the granite pebbles to sit in the flow of water. There were so many places to hide and avoid violence, if only the desire for peace were there in the male batrachian 3-chambered heart.

There was a preferred sitting spot on the lowest flagstone and the classic fight began with one male sitting in the prime place. His position would come to the attention of another male who would very deliberately swim over and climb out nearby, body tense and trembling. The first male would either immediately jump away into the water, conceding status, or remain, perhaps turning to face the challenger. Flanks of both animals would be quivering. Then one would start vocalizing, usually three to five long gra-a-a-a-a-acks, always ending with a staccato bark. The other would then sing his response and turns would be taken till both males were swollen and shaking with barely repressed fury. Finally short barks were exchanged, angry curses, and they'd leap and grapple. Embracing they would rise on the rear legs, dancing, then fall and roll around, falling into the water with splashing and croaking. After a struggle one would pin the other in amplexus and utter fierce and barbaric victory barks. If things got really nasty the winner would submerge the head of the underfrog and keep it under so long that needless anxiety would drive me to interfere. After all, what happened when I wasn't watching? The loser, when he got free, would swim away under water and hide under a projection. Then with the swagger of a sumo, the victor climbed with slow and majestic arrogance onto the throne. The female did not sing or challenge, but if she were grievously provoked she could utter a soft growl. Often the fights involved all three males and they'd pop and wrestle around the tank while the prudent female stayed out of the way. Feeding always ended in a conflict of status. The sly girl would slip in and finish off the food while the silly boys played leapfrog and king-of-the-mountain.

After a time the males settled a pecking order and we named them #1, #2, and #3. The female we called " the girl," a name that persisted past youth as it does with human females. Number 2 and #3 switched order once or twice after #1 was firm in his status. He had the deepest, the loudest, the most manly croak. He would regale us on warm summer days with several series of calls. (" Can't you shut up that frog!") The other males would call too, stimulated by his call, but the higher, softer voices were easy to distinguish. Sometimes, moved to anger at the impudence of a wimpy voice, #1 would attack an inferior and put him in his place. Contrariwise, a rebel, smarting at the regal crow, would start a mutter of provoking growls and barks, often wisely leaping away before the quivering king attacked.

All had reached their full length of about 3" by the second summer and body shape changed. All became stouter, the girl with pillowy flanks and the males with even thicker arms and nuptial pads. The males, especially #1, developed dignified Mayor Daley jowls. They varied the colors of blotchy mud brown and green with shades from pale fatty chicken liver to almost black. Mood frogs. As the second winter approached with cool house temperatures, social life slowed down along with appetite. More time was spent in and under water, with eyes covered with membrane. This was a consistent winter pattern. As the third winter ended and spring started greening the grass, we woke to discover #2 had died in the night, no warning noticed. He floated, legs extended and crossed as they never are seen in life, and he sleeps under the wildflowers if a cat didn't dig him up.

We picked up a late summer juvenile mink while visiting in upstate New York. After raising it to size, seeing it develop into a healthy male, I exercised my malicious and god-like power and introduced him into the big tank. First he was terrified, but after a day of hiding he found himself. All his fighting macho mink frog glands kicked in. He knew he was a young frog, a strong frog, and he could whup those old males faster than you could say " Oedipus brek-ek-ex." Number 2 (who had been #3 before the former #2 died) gave in without a struggle, becoming once

again #3. Through habit he still was called #2. Deposing the king was more difficult. He did not go gentle. Although young male won every real all-out grappling match he never totally dominated #1, who took every advantage in snagging back bits of status. Number 1 didn't relinquish food or place without, at least, a defiant bark or growl. After young male settled into a less driven middle age the two switched dominance, back and forth.

Mom enjoyed feeding her froggies too much, enjoyed watching them crane their neckless necks at a moving mealworm, chase a cricket across the water, snap at small fish, stuff a long slimy earthworm back and back again, leap bravely and accurately at flying insects. Poor babies, sometimes a summer fly or moth would get in the house and land on the outside of their screen. Bonk, bonk, bump, bump, the dry strikes would sound against the screen, and only some diverting mealworms could erase the vision of winged bliss. They were a garden to me, a place of ease and diversion from my daily cares.

Alas, it was a dark and stormy night and I noticed a dark bruise on #2. It was under the left foreleg, a place not often revealed, and I filed a mental note. No such injury had ever been seen on any of them before. It didn't seem disabling and behavior was unchanged. Months later the mark was still there and a careful look showed the skin was smoother, more shiny, over that spot. He wore the mark a long time. Suddenly it was all down his side, smooth and reddened, and the eye on the affected side seemed half-closed and blinking with irritation. He was removed. He died.

There remained #1, young male, and the girl. We vainly hoped that it was the dead one's own and exclusive flaw and time passed. Suddenly both males had red patching and eye involvement, a clouded " dirty" eye. The girl, separate and alone, took longer to develop symptoms. Treatment with antibiotics was too late for the males. They dropped off—old, then young. The female was checked frequently. How could she survive this corrosive plague?

Her eyes never did clear completely, those bright eyes that are the glory of the Ranidae; they have a frosty, rheumy film.

In a small tank she sits on her flat granite pebble or in the few inches of still water. She doesn't swim, jump or struggle much when captured for a water change. Her body feels too soft, flaccid, and I cannot escape the feeling of fatal contamination in her skin, her water and her tank.

Is this quiet solitude living death or a grateful retirement? Did they sit together, four froggies facing west on the rock, for sweet company or just because that place and direction made ideal perch? Of the four minks, she chose most often to be alone, but then she seemed either to have lowest status or be outside the system of competition. She has little entertainment value now. In fact, she is a sort of memento mori. Nonetheless by the grace of my sometimes merciful self, whose few powers include "terminal procedure," she will have a bed here till she must go to her long home, or I do, whichever comes first.

Envoy: With the sudden onset of very warm weather she stopped feeding and started floating in a dormant state. She listed like a sinking rowboat, occasionally righting herself with an awkward start. She didn't live long enough to grow thin. There were no marks on her body.

International Herpetological Symposium
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Bull. Chicago Herp. Soc. 48(4):56-58, 2013

What You Missed at the February Meeting

John Archer
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I think I've rather an average intellect that, as for most of us, has huge gaps in its filing cabinet. One of my gaps has been the inability to comprehend that real people are behind what I read and what I learn. I tend to picture ephemeral beings like a fairy godmother waving a wand and having all that written content suddenly appear. Until I became involved with your society I had not had conversations with authors or scientists. I knew they existed, as I know that the Indian Ocean and Antarctica exist, but I'd never actually had interactions with them. Mere mortals could not mingle with that class of being.

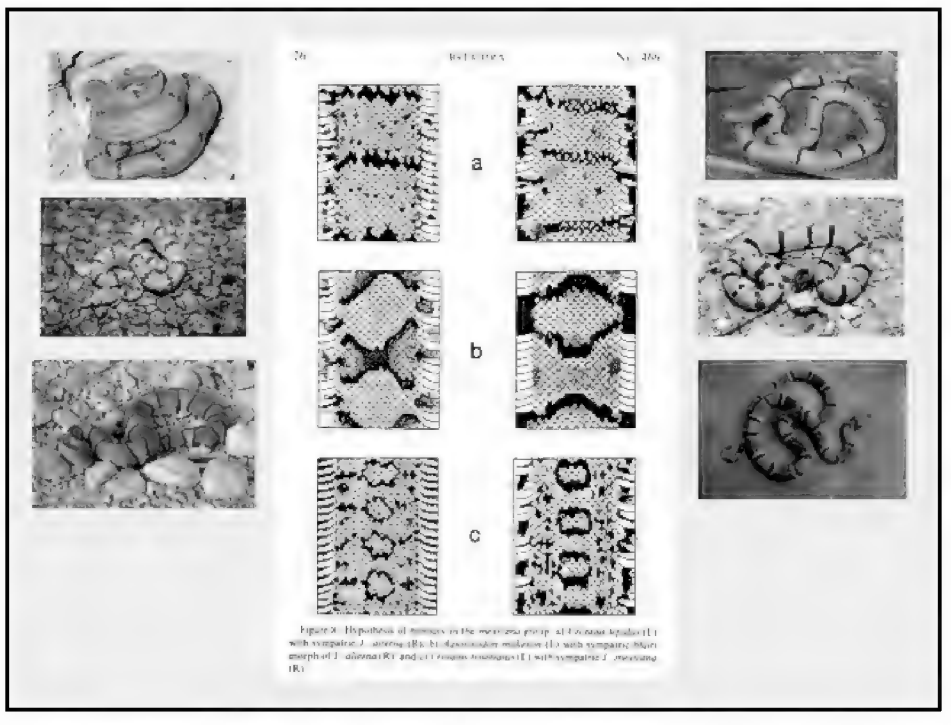
Gerry Salmon. Photograph by Dick Buchholz.

Then I got involved with the Chicago Herpetological Society. I began to meet authors. I've shared drinks with scientists. If you read any of my other writings you know that I remain in awe of both these groups and marvel at their productivity. But what I still have trouble accepting is their ordinariness; almost all are individuals willing to go that extra distance to create something that has not existed before, but after mingling with these folks I've gradually accepted that seemingly ordinary people can do extraordinary things. Gerry Salmon is an excellent example.

His bio says that he's an avid naturalist with a strong interest in herpetology and the geographic distribution of North American reptiles and amphibians. He's been a state park naturalist for New York and South Carolina, an associate of the department of herpetology at the Bronx zoo, and worked at the Miami Serpentarium in the 1980s. He's recently retired from the New York State Police and moved to Boerne, Texas. He's a volunteer curatorial assistant in the Texas Natural History Collection at the University of Texas Austin and a board member of the Southwest Center for Herpetological Research. He's also a leading authority on *Lampropeltis*, particularly *L. alterna*. He's published several articles, coauthored a book, done extensive field, laboratory, and literature research, and bred and raised many hard to keep animals. And he's done all this as a hobby. Gerry is not someone who wonders where all that knowledge comes from because he has created much of it.

He divided his talk into two parts, "Natural History of the Gray-banded Kingsnake: A Look at the Sequence of Discovery over 111+ Years" and "Herping the Texas Trans-Pecos: or rather, Various Critters in the Road . . . " and, as usual, I can only give you a general idea of what he covered.

Beautiful close-ups of *Lampropeltis alterna* started his slide show, followed by a shot of him peering into the cracks of a road cut, typical *alterna* habitat. He thanked his parents for tolerating his interest in herps and dedicated his talk to biologists Andy Price and Bern Tryon, providing pictures and short biographies of them. Then he began a review of the history of *L. alterna*, taking us step-by-step through the first 15 recorded specimens in collections throughout the U.S. The first recorded specimen was discovered in the Davis Mountains of west Texas and collected by Edmund Meyenberg during the summer of 1901. He shipped it to Arthur Erwin Brown, director of the Philadelphia Zoo, who described it as *Ophibolus alternus*. That specimen is deposited in the Academy of Natural Science in Philadelphia. The only data associated with the find were the location, sex, season and year collected. With photos of the actual specimens, tags, journal articles, and biologists, Gerry built a picture of the natural history of *L. alterna* as the knowledge was gained. Each discovery revealed a bit more information about the animals' life. Hobart Smith found the third specimen "…in a crack in a large boulder." The seventh had the "Remains of a *Sceloporus u. consobrinus* in stomach." The eighth specimen was "found active on roadside at 10:00 P.M.," implying a nocturnal snake. Other specimens extended the range and confused the taxonomy with various morphs, but we observed the gradual revelation of the snakes' habits and habitats as Gerry took us through the first fifteen. Gerry obviously is well versed on the snakes, but he also studied the people behind the finds, continually mentioning interesting asides such as Meyenberg's death by gunshot two years after collecting the type specimen of *L. alterna*, or showing us photos of William W. Milstead's notes on collecting the eighth specimen. He gave us the story behind the continuing taxonomic confusion surrounding gray-bands and examples of the earliest and best attempts at compiling the natural history of the animal. He tracked down photos of the original specimens used to illustrate guidebooks and gave us food for thought with a proposal that the snakes are mimics of

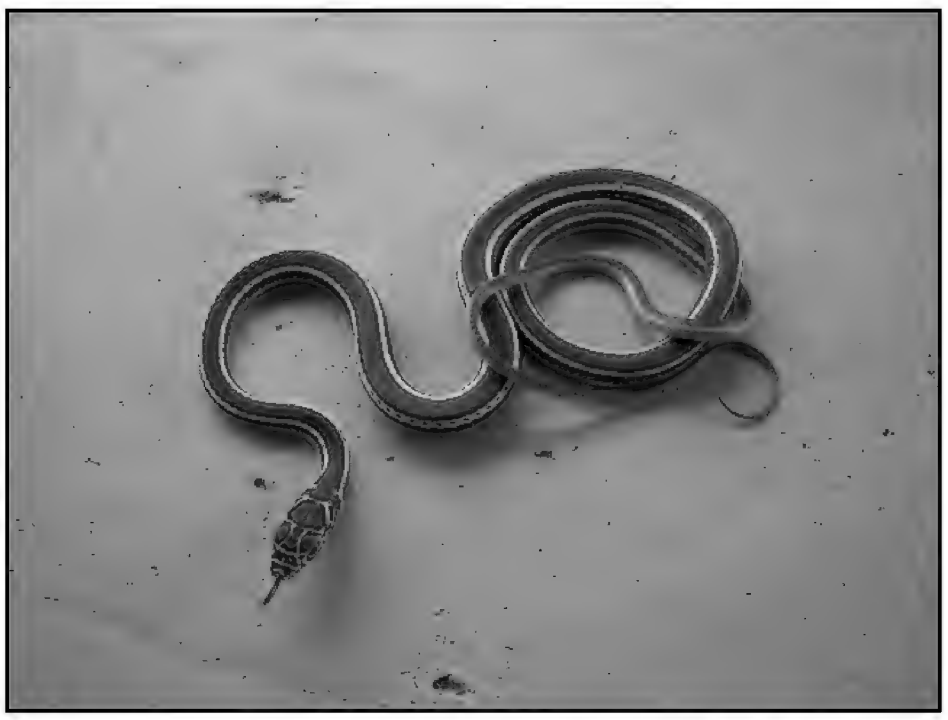


A slide suggesting that gray-banded kingsnakes may be mimics of the venomous snakes found in the same locality. The top two photos on the left show rock rattlesnakes (*Crotalus lepidus*). At the bottom left is a trans-Pecos copperhead (*Agkistrodon contortrix pictigaster*). Photo credits: top to bottom left, Troy Hibbits, Gerry Salmon, Damon Salceies, and top to bottom right, Richard D. Worthington, Michael Geiger and Buzz Ross.

Great Plains ratsnake (*Pantherophis emoryi*). Photograph by Gerry Salmon.

Texas horned lizard (*Phrynosoma cornutum*). Photograph by Gerry Salmon.

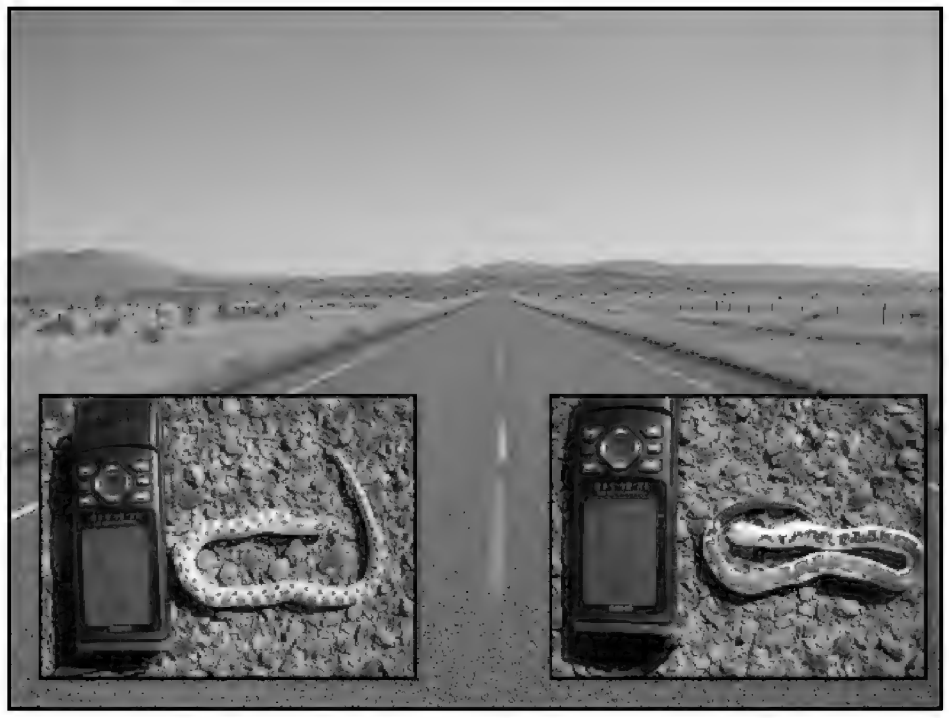
Patch-nosed snake (*Salvadora grahamiae*). Photograph by Gerry Salmon.



Striped whipsnake (*Coluber taeniatus*). Photograph by Gerry Salmon.

Checkered gartersnake (*Thamnophis marcianus*). Photograph by Gerry Salmon.

A clear demonstration of the variability of the gray-banded kingsnake (*Lampropeltis alterna*). All these snakes were found within ten miles of each other. Photograph by Damon Salceies.



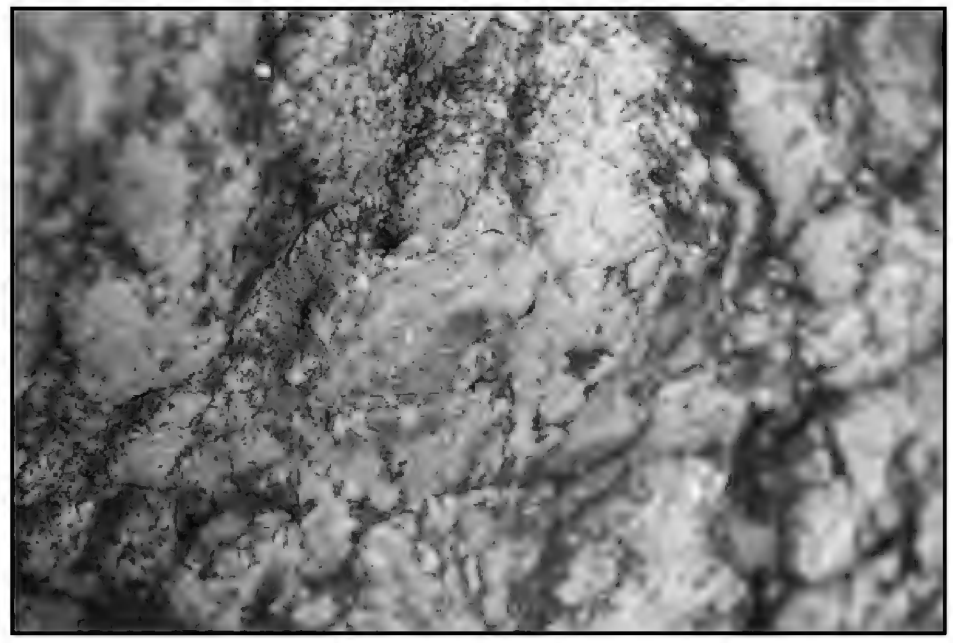
A photograph of the habitat, together with dorsal and ventral shots alongside a GPS is a reliable way to record your finds. Here the specimen is a road-killed Mexican hog-nosed snake (*Heterodon kennerlyi*). Photographs by Gerry Salmon.

the local rock rattlers (*Crotalus lepidus*) and Trans-Pecos copperheads (*Agkistrodon contortrix pictigaster*) accompanied by an excellent and convincing slide showing the similarities of the sympatric species.

We saw examples of popular articles about the snakes and pictures of the people that pursue the snakes. Gerry talked about his opinion of the Texas herping laws and the success of careful captive breeding in revealing the variable patterns of specific localities. He talked of the first "Snake Days" in Sanderson, Texas, showed the attendees and mentioned the $5,000 raised for the underfunded state biologists in the Texas Parks and Wildlife Department. And he finished with a photo of a desert kingsnake (*Lampropeltis getula splendida*) eating a gray-band. It was staged. The gray-band was a road-kill they fed to the kingsnake, but it was still a cool photo.

He smoothly transitioned to the second part of his presentation with a photo of a black-tailed rattlesnake (*C. molossus*), followed by a map of the trans-Pecos counties in Texas and photos of the landscape and habitat, including an impressive night shot of the wild fire that ravaged the Davis Mountains two years ago. In situ shots showed how easily a western diamond-backed rattlesnake (*C. atrox*) is to identify when it's crossing a road in daylight. Photos of cute kids holding cool animals accentuated his appeal for us to get more youngsters involved in herping. And photos of adults emphasized that not only the young are enthusiasts. A photo of a trans-Pecos ratsnake (*Bogertophis subocularis*) was followed by a wider view featuring the snake paparazzi surrounding the critter and then a photo of the paparazzi escaping the midday west Texas heat with a few drinks on the porch of their hotel. A composite slide showing habitat and dorsal and ventral views with a GPS of a DOR hognose illustrated Gerry's appeal for all herpers to keep careful documentation while in the field. Evidence well recorded can be valuable to many researchers.

A yellow mud turtle (*Kinosternon flavescens*) showed that the desert is not all dry. A Chihuahuan spotted whiptail lizard (*Aspidoscelis exsanguis*) and a crevice spiny lizard (*Sceloporus poinsettii*) grabbed our attention. With a Texas horned



A well camouflaged canyon treefrog (*Hyla arenicolor*). Photograph by Gerry Salmon.

lizard (*Phrynosoma cornutum*) on the screen Gerry mentioned that their numbers are declining rapidly perhaps due to changes in the ants that are their food source. Gerry showed a few slides highlighting the amazing camouflage capabilities of the canyon treefrog (*Hyla arenicolor*) and numerous photos of rattlesnakes, including black-tailed, prairie (*C. viridis*), rock, and Mojave (*C. scutulatus*) rattlers. A ventral shot of a Trans-pecos copperhead showed why the subspecies' Latin name is *pictigaster*, meaning a painted or embroidered belly. A beautiful red and black long-nosed snake (*Rhinocheilus lecontei*) filled the screen followed by a green Couch's spadefoot (*Scaphiopus couchii*). He ended with a photo of Mike Price pointing to a gorgeous gray-band on a rock wall and a last slide of a beautiful west Texas rainbow.

Gerry mentioned at the beginning of his talk that he had accumulated enough info for this talk that he could write a book. He knew that he'd gone too far when his hard drive crashed. Taking that as a hint, he scaled back the talk. He covered the natural history of the gray-banded kingsnake and herping in the trans-Pecos region, but he also talked about much more. He spoke about the importance of involving children in the herpetology. He gave us background on many famous and lesser-known biologists. He showed how we can make a difference in the public's perception of these animals by collectively engaging in efforts like the Snake Days in Sanderson, Texas. He managed to give us a taste of how science gradually expands our knowledge through bits of data and he encouraged us to help collect that data by demonstrating how even we amateurs can collect meaningful data. And that was after he shortened his presentation. We're going to have to have him back for the rest.

Herpetology 2013

In this column the editorial staff presents short abstracts of herpetological articles we have found of interest. This is not an attempt to summarize all of the research papers being published; it is an attempt to increase the reader's awareness of what herpetologists have been doing and publishing. The editor assumes full responsibility for any errors or misleading statements.

EVIDENCE OF SNAKE DECLINES

G. C. Akani et al.[2013, Herpetozoa 25(3/4):133-142] note that recent studies suggest that snakes are widely declining in at least three continents, and that this decline has targeted some species of tropical Nigeria, West Africa. To describe the possible interrelations among different causes and the boundary conditions to forecast snake decline, the authors explored local communities' ecological knowledge in this respect, i.e., that cumulative body of knowledge and beliefs concerning snakes, shared in the human community by cultural transmission, thus constituting the social memory. The authors describe a survey-based participatory approach to reinforce the scientific analyses of snake declines in the River Niger Delta, where significant snake declines have been detected over the last decade. They compared the results of two questionnaire-based surveys (the first in 1996–1997 and the second in 2011–2012) to farmers and hunters in a same set of 41 villages. The standardized questionnaire consisted of two parts: (i) a section with general questions on the personal attitude ofthe respondent toward snakes, and (ii) a section with three questions on perceived snake diversity, habitat, and current abundance around the villages of those interviewed. Three main patterns emerged: (1) the social shared role (value and dangerousness) ofsnakes in the rural communities was constant in the last 15 years; (2) some species were perceived as declining; and (3) the habitat - species relationships are slightly changed. The implications ofthese patterns are discussed, given that several aspects ofthe perceived changes in population abundances of targeted snakes were indeed consistent with herpetological scientific data from the field.

GUIDE TO STUDYING MALFORMED AMPHIBIANS

K. B. Lunde and P. T. J. Johnson [2012, J. Herpetology 46(4): 429-441] review field-based surveys and experimental approaches used over the last decade to address the issue of severely malformed amphibians. The authors offer specific recommendations regarding amphibian-sampling techniques, including methods to capture and examine amphibians, with the aim of enhancing the accessibility of this topic to scientists, students, and educators of diverse backgrounds. Based on established approaches from epidemiology, they provide recommendations regarding methods to identify proximate causes(s) of abnormalities with a focus on using "multiple lines of evidence," including large-scale field surveys, comparing malformation "signatures" between field and laboratory studies, and using of manipulative experiments at multiple spatial scales. As an example, they describe methods to examine the causal influence of infection by the trematode parasite, *Ribeiroia ondatrae*, including quantifying presence and abundance within amphibian and snail host populations with adequate power of detection. The authors conclude by identifying outstanding questions with the goal of stimulating additional research to evaluate the causes and consequences of amphibian malformations.

HITTING THE GROUND RUNNING

J. S. Doody and P. Paull [2013, Copeia 2013(1):160-165] note that evidence is accumulating for the ability of animal embryos to hatch early in response to the immediate threat of egg predation. However, early hatching in response to predation is known from only amphibians, fish, and invertebrates. This study presents the first quantitative evidence for induced early hatching in a reptile. In two laboratory experiments, delicate skink (*Lampropholis delicata*) embryos responded to a surrogate predator cue—vibrations—by hatching 3 days earlier than their spontaneously hatching clutchmates. Early hatching embryos were significantly smaller and left more residual yolk in their eggs, however, suggesting a cost to hatching early. Assuming that the vibrations were interpreted as an increase in predation risk, skink embryos can thus forego some yolk absorption and growth when threatened by imminent predation. Simulated predation experiments in the field induced hatching in both nest sites (horizontal rock crevices) and in eggs displaced from nest sites. The hatching process was explosive: early hatching embryos hatched in seconds and sprinted from the egg an average of 40 cm as they hatched. These results are unusual in demonstrating early hatching in a terrestrial animal with a simple life cycle, and likely extend predation-induced early hatching to reptiles. Early hatching may be widespread in oviparous vertebrates.

SPATIAL ECOLOGY OF ARMENIAN VIPERS

J. A. Ettling et al. [2013, Copeia 2013(1):64-71] note that Armenian vipers (*Montivipera raddei*) have a restricted and fragmented distribution throughout portions of Armenia, eastern Turkey, and northwestern Iran. Over the past 40 years their population numbers have dropped by nearly 88% due to a combination of over-collection for the pet trade, conversion of habitat to agriculture, and overgrazing by livestock. While a few studies have examined aspects of their reproductive biology, very little is known about the spatial ecology of this species. The authors used radiotelemetry to study the spatial ecology and habitat use of Armenian vipers inhabiting a landscape modified by human use in Kotayk Province, Armenia, during the spring seasons of 2007–2009 (17 males, 11 females) and for complete active seasons in 2008 and 2009 (8 males, 6 females). They found no significant difference between sexes for home range size, average movements, or movement rates through areas involving cropland versus strictly steppe. Home ranges were significantly larger for males whose spring core area included some cropland. Both sexes showed significant preference for mountain steppe over cropland. Despite these differences, the interspersing of cropland among steppe habitat does not appear to impede the snakes' movements and seasonal use of the available habitat. While conservation of intact mountain steppe habitat is the ultimate goal, providing corridors of habitat in areas of agricultural development should be considered a high priority for managing this viper population into the future.

CORAL SNAKE REPRODUCTIVE STRATEGIES

O. A. V. Marques et al. [2013, Herpetologica 69(1):58-56] note that New World coral snakes (genus *Micrurus*) occur from North to South America in a wide range of climates and habitats. Using both original and published data, they show that reproductive patterns diverge in the two phylogenetic lineages of *Micrurus* within the subtropical regions. Species with black rings arranged in triads are characterized by males larger than or equal in size to females, male combat behavior, and a broader season of vitellogenesis and oviposition. In these species, mating in autumn is synchronous with both spermatogenesis and vitellogenesis. Thus, females need to store sperm until ovulation in spring. In species with black rings arranged in monads, females are generally larger than males, there is no male–male combat, and seasonal vitellogenesis occurs in spring synchronous with mating. Egg laying occurs from late spring to summer, and hatchlings emerge from late summer to autumn. Spermatogenesis peaks during autumn, and males store sperm in the deferent duct over winter, until the mating season. Despite these phylogenetic trends, climatic influence on the extension of reproductive cycles was evident, with equatorial species exhibiting more continuous cycles and species from cold areas exhibiting more seasonal cycles. These two disparate reproductive strategies may be considered another differential trait between these two clades of *Micrurus* showing the high divergence between them.

SAW-SCALED VIPER HABITAT CHOICE

R. Yosef et al. [2012, J. Herpetology 46(4):671-674] hypothesized that Palestine saw-scaled vipers (*Echis coloratus*) select ambush sites that allow them to remain in a relatively cooler microclimate. During spring 2010, the authors located 27 vipers in the Eilat Bird Sanctuary, Israel. Twenty-six (96%) vipers were recorded in 15 *Salvadora persica*, one (4%) in *Zygophyllum dumosum*, and none in *Ochradenus baccatus*. The temperature at the base of the *S. persica* was on average 6°C lower that in *O. baccatus*. It was also found that the greater the apron radius of *S. persica*, the lower the temperature in the bush, and that bushes of *S. persica* occupied by vipers, have greater apron radius that those without snakes. Each of the snakes remained in the bush in which it was found during the whole three months of the study. The authors conclude that the cues used by *E. coloratus* for predicting future prey availability seem to be the structure of the microhabitat rather than prey odor. This study is of conservation importance and enhances understanding of habitat choice in this little-studied snake.

EUROPEAN POND TURTLE REPRODUCTION

S. Mitrus et al. [2012, The Herpetological Journal 22(4):235-239] analyzed long-term (1987–2011) data on the reproduction of the European pond turtle, *Emys orbicularis*, in western and central Poland. In contrast to earlier evidence, which suggested that *E. orbicularis* rarely reproduces successfully in the northern part of its distribution area, the authors document successful reproduction in at least 16 out of the last 20 seasons, including annual reproduction since 1998. Hatchlings emerge either in late summer or autumn, or overwintered in nests and emerged between late February and May of' the following year.

GOPHER FROG CONSERVATION

W. J. Humphries and M. A. Sisson [2012, J. Herpetology 46(4): 665-670] note that the gopher frog, *Lithobates capito*, is an endemic to upland, fire-maintained pine forests on the Southeastern Coastal Plain and requires open, isolated wetlands for breeding. This species has experienced drastic population declines because of habitat loss and degradation and now occurs only in scattered populations in the southern United States. The authors tracked the post-breeding movements and burrow use of 17 gopher frogs in the Sandhills of North Carolina using radio telemetry. Nine frogs were successfully tracked to summer refugia; the other eight frogs shed their transmitters or were killed by predators or fire during migration. Frogs traveled 0.5–3.5 km (mean = 1.3 km) between the breeding pond and a summer refugium. The 3.5-km movement is substantially longer than has been reported for gopher frogs before. The results suggest that an area of 3,739 ha (9,239 acres) around breeding ponds is required to provide summer habitat for gopher frogs. Eight of nine frogs used holes associated with the stumps of longleaf pines for their summer refugia, and fidelity to particular stumps was documented, with one frog traveling long distances from breeding pond to the same summer refugium during two consecutive seasons. Frogs only made major movements during rainy nights. Prolonged presence on the forest floor during post-breeding migrations exposed frogs to prescribed fires conducted in the spring. Prescribed burning within several kilometers of gopher frog ponds should be conducted after mid-May to reduce adult mortality.

DIETARY OVERLAP BETWEEN CAIMAN SPECIES

T. M. Laverty and A. P. Dobson [2013, Herpetologica 69(1):91-101] note that the black caiman (*Melanosuchus niger*) experienced a dramatic population decline in the mid-20th century, becoming extinct or locally rare over most of its range due to habitat destruction and the commercial value of its hide. As the success and re-establishment of the species is now dependent on conservation efforts throughout the Amazon basin, black caimans require continuous monitoring despite extensive current legal protection. Although such efforts have mitigated the threat of human harvesting, a key issue facing the species today is ecological competition from sympatric spectacled caimans (*Caiman crocodilus*). This study investigated this inferred competition by detailing the dietary overlap between black caimans and spectacled caimans in the Pacaya Samiria National Reserve in 2009. Using an adaptation of the hose-Heimlich technique, the stomach contents of several individuals of each species were collected and then compared. It was found that although the proportions of prey items in their stomach contents varied seasonally, the dietary overlap between the two species remained high, suggesting intense competition for food resources. In addition to seasonal changes, the diet composition of black caimans also shifted ontogenetically. Young black caimans primarily ate insects and crustaceans, whereas larger individuals mostly preyed on fish, reducing intraspecific competition between crocodilian adults and young. These findings suggest that spectacled caimans will continue to hinder the recovery of the black caiman population.

HEALTH ASSESSMENT OF MASSASAUGAS

M. C. Allender et al. [2013, Copeia 2013(1):97-102] note that with the current rate of declines in global biodiversity, wildlife diseases are serving as additional threats to population declines and potentially species extinctions. Free-ranging eastern massasaugas (*Sistrurus catenatus catenatus*) have been reported susceptible to numerous health threats, one of which is a fatal fungal dermatitis. In response to the occurrence of the fungal dermatitis, a health survey and disease investigation was conducted on eastern massasaugas near Carlyle, Illinois, in 2011. Thirty-eight eastern massasaugas were captured from March to April 2011. Polymerase chain reaction assays were performed from swabs collected from the faces of 34 snakes. The study resulted in hematologic data for 31 individuals, plasma biochemical data for 24, and toxicological data for 18. There was no evidence of *Chrysosporium* in any of the samples. Hematologic and plasma biochemistry parameters were consistent with previous health studies in the Carlyle population. Elemental toxicologic investigation of the plasma indicated variable levels of lead, copper, selenium, strontium, tin, iron and zinc.

DECLINE AND FLOUNDER OF A TOAD POPULATION

T. Beebee [2012, The Herpetological Bulletin (121):6-16] notes that common toads (*Bufo bufo*) have declined over much of southern and eastern England in recent decades. One such toad decline, at Offham marshes in Sussex, was investigated over the 15-year period 1998–2012 immediately subsequent to a tenfold decrease in population size between 1989 and 1997. Syntopic amphibians (*Rana temporaria*, *Lissotriton vulgaris* and *L. helveticus*) probably also declined at this site. The surviving toad population continued to recruit new cohorts and had an apparently healthy age structure. Habitat quality (aquatic and terrestrial) remained good and there was no evidence of disease. An invasive species (*Pelophylax ridibundus*) was excluded as a likely cause of toad decline. However, traffic on a neighboring road rendered more than half the previously available terrestrial habitat essentially unreachable. Furthermore, reduced management of vegetation in ditches where the toads breed apparently increased mortality of developing tadpoles. Future prospects for conserving and increasing the toad population are discussed.

EFFECTS OF HARVESTING ALLIGATOR SNAPPERS

C. A. F. Howey and S. A. Dinkelacker [2013, Copeia 2013(1): 58-63] note that following perturbations like commercial harvests, turtles are susceptible to population declines because of life history characteristics such as long generation times, low recruitment rates, delayed maturity, and slow growth rates. Prior to gaining state-wide protection in 1993, the alligator snapping turtle (*Macrochelys temminckii*) was commercially harvested in Arkansas. The authors conducted a mark–recapture study from 2005 through 2007 on a population of *M. temminckii* known to have been harvested in the East Fork Cadron Creek, a slow-moving stream in central Arkansas and part of the Mississippi River drainage. Captured turtles were marked, measured, weighed and sexed. The authors compared observed characteristics to what would be expected if this population did not exhibit any evidence of past commercial harvest. They caught few large adults and approximately one adult for every juvenile. The adult sex ratio was highly female biased (6 F:1 M). Population density (18 turtles/km stream reach) was slightly lower than expected. The apparent survivorship for males (0.96), females (0.88), and juveniles (0.80) appear to be as expected for a large freshwater turtle. Whereas high survivorship may ameliorate the effects of historical commercial harvest, slow growth rates, low reproductive success, and long generation times have assured these effects to be long lasting and still present in the study population. The authors suggest other factors impeding recovery, such as life history characteristics and incidental catch by fishermen.

HARVEST OF ENDANGERED SIDENECKS

C. L. Peñaloza et al. [2013, Copeia 2013(1):111-120] quantified illegal and unmonitored harvest of three endangered sideneck turtles (*Podocnemis* spp.) by examining discarded turtle shells in 29 riverine communities both up- and down-river from the Arrau Turtle Wildlife Refuge in the Middle Orinoco, Venezuela. They compared harvested turtle sizes to those captured during in-water research surveys to determine harvest selectivity. Fresh sideneck turtle shells were found in most communities visited; carapaces and plastrons from *P. expansa* were the most abundant despite their protected status. Turtle harvest was skewed toward females in all species, and toward juvenile *P. expansa* and adult *P. unifilis* and *P. vogli*. Considering historical accounts of widespread turtle husbandry in the area, *Podocnemis* spp. life history, and population recovery for these species in community-based conservation programs elsewhere in South America, the authors recommend community-managed captive breeding of faster-maturing *P. unifilis* and *P. vogli* to satisfy turtle consumption needs. These measures, along with improved nesting-beach protection, may allow recovery of populations of *P. expansa* and make possible their legal subsistence harvest in the future.

CHYTRID FUNGUS IN ETHIOPIA

D. J. Gower et al. [2012, The Herpetological Journal 22(4): 225-233] note that surveys of the potentially lethal amphibian chytrid fungus (*Batrachochytrium dendrobatidis* - *Bd*) in Africa are patchy, especially in some regions of high species endemicity. The authors present results of the first *Bd* surveys of wild amphibians in Ethiopia, for two upland regions on either side of the Rift Valley: the Bale Mountains and the Kaffa region. Surveys were opportunistic so that robust interpretation of the data is limited. Utilizing diagnostic qPCR assays, 51 out of 120 frogs (14 species in 10 genera) tested positive for *Bd* at altitudes of 1,620–3,225 m, across all genera and species, and all but two localities. Prevalence was not significantly different between the two regions or two years (2008, 2009) sampled. Prevalence and parasite load was higher in species with aquatic tadpoles than those with terrestrial early life-history stages, but these differences were not significant. Impacts of *Bd* infection were not investigated, but no dead or dying frogs were found. This is the first report of *Bd* in Ethiopia, a country in which approximately 40% of its more than 60 species are endemic. Declines have occurred in some frog species in some localities in Ethiopia, and although habitat degradation is a likely cause in at least some places, further studies of *Bd* in Ethiopia are required to understand if it is a threat.

Unofficial Minutes of the CHS Board Meeting, March 15, 2013

The meeting was called to order at 8:05 P.M. at the Schaumburg Public Library. Board members Stephanie Cappiello, Mike Dloogatch, Jason Hood, Nancy Kloskowski and Andy Malawy were present. A quorum was not present

Officers' Reports

Recording Secretary: Mike Dloogatch read the minutes of the February 15 board meeting.

Treasurer: Andy Malawy went over the February financial reports.

Membership Secretary: Mike read a list of expiring memberships and said we are steady around 500 people

Sergeant-at-arms: JimFoster was not present, but told Jason there were 30 people at the February meeting

Committee Reports

Shows:
• Notebaert Nature Museum, first full weekend of each month.

ReptileFest: Jason Hood is looking for a vendor to supply live plants. Jason also reported that this year we will advertise in *Family Time Magazine* as well as *Chicago Parent*.

Old Business

The CHS was able to arrange for 3,000 cards advertising 'Fest to be put into Kids Expo bags.

Business cards, a banner and a poster board have been made for the Junior Herpers.

The CHS has purchased a new Windows7-based computer. Thanks to John Archer for taking care of this. We are still planning to purchase a new projector and a cordless microphone.

Jason emphasized that we should be promoting the Midwest Herp Symposium, August 31–September 3, in Peoria and the Innternational Herp Symposium, July 31–August 3, in New Orleans.

New Business

Those present discussed SB2362, a bill before the Illinois senate that is intended to replace all existing laws pertaining to reptiles and amphibians.

It was decided to cancel the April board meeting because of the conflict with ReptileFest.

Jason announced that Grossboy Exotics will be selling frozen rodents at general meetings

Round Table

John Archer's daughter Grace was accepted into the University of Illinois Vet School.

Roy Carlson and Teresa Savino have one last tuition payment for daughter Rosalie.

Jason is happy that we finally have the new banners.

Linda Malawy reported by telephone that our booth at the Chicagoland Family Pet Expo was going well.

The meeting was adjourned at 9:34 P.M.

Respectfully submitted for the recording secretary by Stephanie Cappiello

Advertisements

For sale: rats and mice—pinkies, fuzzies and adults. Quantity discounts. Please send a SASE for pricelist or call Bill Brant, *THE GOURMET RODENT*, PO Box 430, Newberry, FL 32669-0430, 352-472-9189, E-mail: GrmtRodent@aol.com.

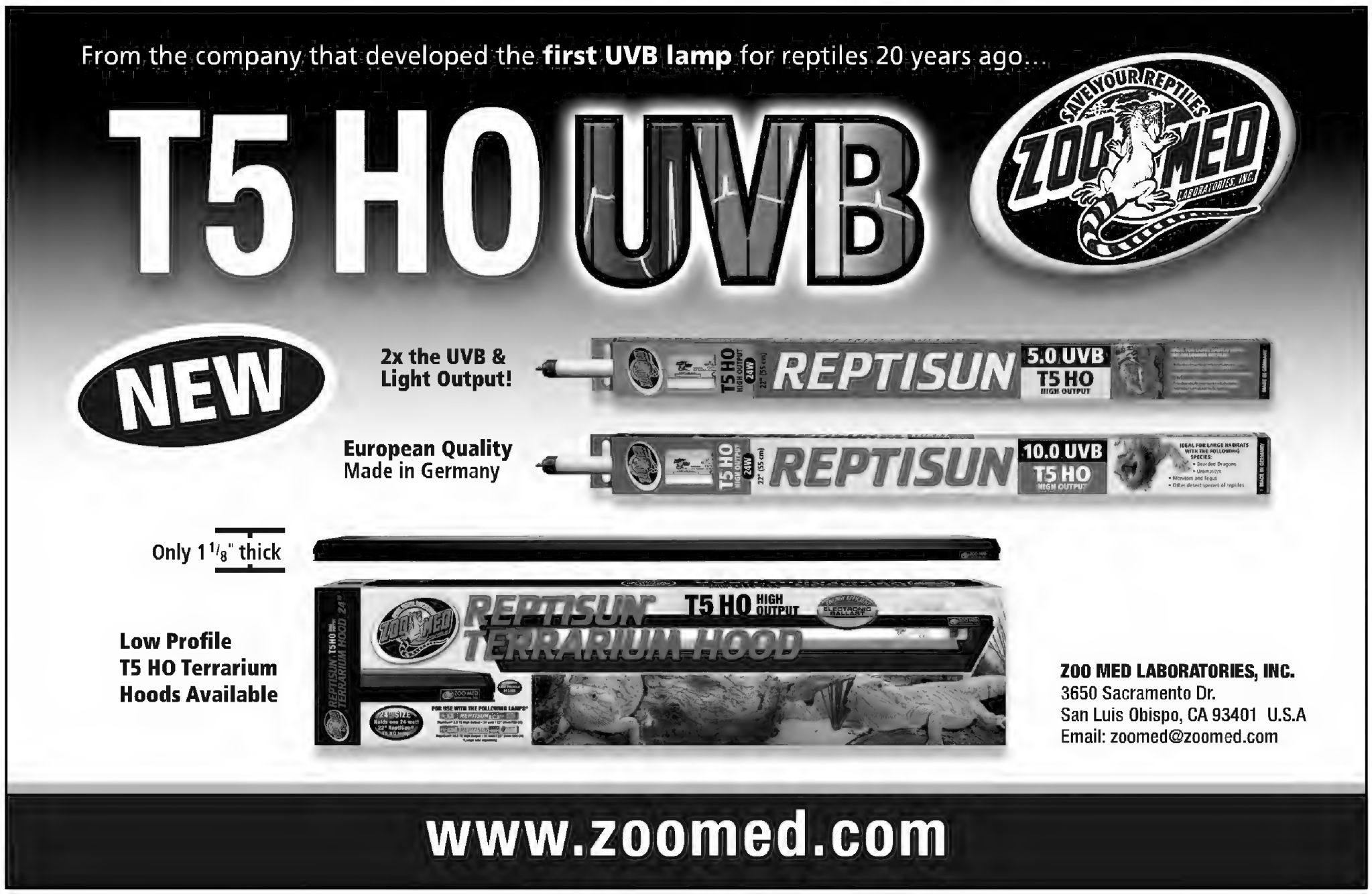
For sale: **highest quality frozen rodents**. I have been raising rodents for over 30 years and can supply you with the highest quality mice available in the U.S. These are always exceptionally clean and healthy with no urine odor or mixed in bedding. I feed these to my own reptile collection exclusively and so make sure they are the best available. All rodents are produced from my personal breeding colony and are fed exceptional high protein, low fat rodent diets; no dog food is ever used. Additionally, all mice are flash frozen and are separate in the bag, not frozen together. I also have ultra low shipping prices to most areas of the U.S. and can beat others shipping prices considerably. I specialize in the smaller mice sizes and currently have the following four sizes available: Small pink mice (1 day old—1 gm) , $25 /100; Large pink mice (4 to 5 days old—2 to 3 gm), $27.50 /100; Small fuzzy mice (7 to 8 days old—5 to 6 gm) , $30/100; Large fuzzy mice / hoppers (10 to 12 days old—8 to 10 gm), $35/100 Contact Kelly Haller at 785-234-3358 or by e-mail at kelhal56@hotmail.com

For sale: High quality, all locally captive-hatched tortoises, all bred and hatched here in the upper midwest. Baby leopards, Sri Lankan stars, and pancakes usually available, and are all well-started and feeding great! Leopards are $125 ea., Sri Lankans (2012 hatched) $475 ea. And Pancakes are $195 ea. Leopards for out of state sale/shipping require a veterinary health certificate (inquire for cost). E-mail at KKranz1@wi.rr.com or call Jim or Kirsten at 262 654 6303.

Herp tours: **Costa Rica herping adventures**. Join a small group of fellow herpers for 7 herp-filled days. We find all types of herps, mammals, birds,and insects, but our target is snakes. We average 52 per trip, and this is our 10th year doing it. If you would like to enjoy finding herps in the wild and sleep in a bed at night with air-conditioning, hot water and only unpack your suitcase once, instead of daily, then this is the place to do it. Go to our web-site http://hiss-n-things.com and read the highlights of our trips. Read the statistics of each trip and visit the link showing photos of the 40 different species we have found along the way. E-mail at jim.kavney@gmail.com or call Jim Kavney, 305-664-2881.

Summer Herpetological Field Classes: Research 4 Reptiles, LLC, has openings for ages 12 years to adult for herpetological field classes. Assist in real research studies and learn species identification, capture techniques, and data collection. All classes are limited to 8 individuals and are taught entirely outdoors at pond/prairie sites within Midewin National Tallgrass Prairie in Wilmington, Illinois. Registration details and class information can be found on our website at http://www.research4reptiles.biz. For questions, email Holly Zak at research4reptiles@comcast.net or call 630-337-0757.

Line ads in this publication are run free for CHS members—$2 per line for nonmembers. Any ad may be refused at the discretion of the Editor. Submit ads to mdloogatch@chicagoherp.org.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INDIANAPOLIS ZOO TRIP

On Saturday, **May 11, 2013**, your Chicago Herpetological Society is offering members a behind-the-scenes visit to the Indianapolis Zoo. We will meet at the zoo Saturday morning; no group transportation provided. Purchased in advance, our discounted rate for admissions is: **$13.50 per adult, and $9.50 for children 2–12**. The discounted parking rate is **$ 5.00 per vehicle**. Space is limited. The operating hours are 9–5 on Saturday. Go to indyzoo.com for in-depth information regarding the zoo experience. More information will follow; please watch the CHS Facebook page for updates. Private tour times not yet determined, but will be around noon to 1:00 P.M. start time. To reserve space and purchase discounted tickets, **contact Linda at 630-717-9955**.

Deserts Biome

The zoo is known worldwide for its successful research and for breeding of some of the rarest desert reptiles. The Indianapolis Zoo was the first zoo in the world to successfully breed the extremely endangered Grand Cayman blue iguana and is the only zoo to successfully breed the rare Jamaican iguana. The attention to detail in the Deserts Biome sets it apart from other desert exhibits across the nation. The 80-foot diameter transparent dome allows the animals to bask in natural sunlight year-round while heating and air conditioning vents hidden in the rocks keep the temperature in the 80s.

The Zoo's overall goal to immerse visitors in the natural habitats of its animals was firmly in mind when designing the Deserts Biome, which opened in 1990. Zoo staff spent two weeks in Tucson, Arizona, making rubber molds of actual rocks that decorate the Deserts Biome. The granite gravel lining the floor of the exhibit was trucked in from Arizona, and the giant sculpted rocks were painted to match the color of the gravel. The rocks are situated to form a canyon and river and to create a walkway through the dome for visitors. Larger animals are behind glass in the exhibit areas, but the birds and smaller lizards roam freely throughout the dome. If a lizard finds itself in the middle of a turf battle or being pursued by a rambunctious young visitor, it can take cover in one of 75 "hide tubes" throughout the dome. The tubes are made of drainage piping built into the rocks and lined with gravel to provide traction.

About 250 species of plants, several of which are endangered, flourish in the biome. Planters constructed inside the rocks give the appearance that the plants grow from within the terrain. All of the plants in the biome are living and cared for daily by the horticulture staff. The temperature in the deserts dome is regulated at 85° in the summer and 82° in the winter. It is lowered to simulate a seasonal change and encourage some of the animals to maintain their hibernation schedule just as they would in the wild. Some animals, like the endangered desert tortoise, need even lower temperatures to hibernate. For the tortoises' winter nap, keepers settle them into a special refrigerator off exhibit to sleep at a chilly 55° until spring. The Deserts Biome is home for another species of tortoise, the radiated tortoise of Madagascar. In late 1995, the zoo was first successful in breeding this endangered tortoise, and many more have been born since.

Drop Dead Gorgeous Snakes

Opened in June 2000 inside the Deserts Dome, this permanent exhibit presented by AT&T Advertising Solutions features some of the most gorgeous—and deadly—snakes on the planet. In the "Snakes as Art" gallery, the exhibit includes 13 of the most beautiful snakes in the world highlighted with pinpoint fiber optics as they rest in "jewel box" cases. A curving "habitat wall" highlights a second gallery—a collage of spectacular images showing the many different kinds of snakes and the myriad environments in which they can be found. Visitors may sit on a full-size model of the world's largest snake—a 33-foot-long version of a reticulated python with a body fully 16 inches in diameter.

The "Snakes and People" gallery, where the many myths that surround these creatures are exploded, is one of the most important parts of the exhibit. The focus is on how snakes are cared for in the zoo and on some of the key research and conservation programs in which zoos throughout the world are engaged.

See indyzoo.com for more enticement!

UPCOMING MEETINGS

The next meeting of the Chicago Herpetological Society will be held at 7:30 P.M., Wednesday, April 24, at the Peggy Notebaert Nature Museum, Cannon Drive and Fullerton Parkway, in Chicago. **Dan Krull**, of Shawnee, Kansas, will speak about how the state of Kansas has been benefiting from the efforts of citizen scientists. The talk will explain in some detail how amateur herpers can provide valuable data and even tissue samples. Dan is familiar to many of you as a talk show host for Herp Nation Media.

At the May 29 meeting **Russ Gurley**, founder of the Turtle and Tortoise Preservation Group, will speak on a topic relating to chelonians.

The regular monthly meetings of the Chicago Herpetological Society take place at Chicago's newest museum—the **Peggy Notebaert Nature Museum**. This beautiful building is at Fullerton Parkway and Cannon Drive, directly across Fullerton from the Lincoln Park Zoo. Meetings are held the last Wednesday of each month, from 7:30 P.M. through 9:30 P.M. Parking is free on Cannon Drive. A plethora of CTA buses stop nearby.

Board of Directors Meeting

Are you interested in how the decisions are made that determine how the Chicago Herpetological Society runs? And would you like to have input into those decisions? If so, mark your calendar for the next board meeting, to be held at 7:30 P.M., May 17, in the adult meeting room on the second floor of the Schaumburg Township District Library, 130 S. Roselle Road, Schaumburg..

The Chicago Turtle Club

The monthly meetings of the Chicago Turtle Club are informal; questions, children and animals are welcome. Meetings normally take place at the North Park Village Nature Center, 5801 N. Pulaski, in Chicago. Parking is free. For more info visit the group's Facebook page.

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BULLETIN
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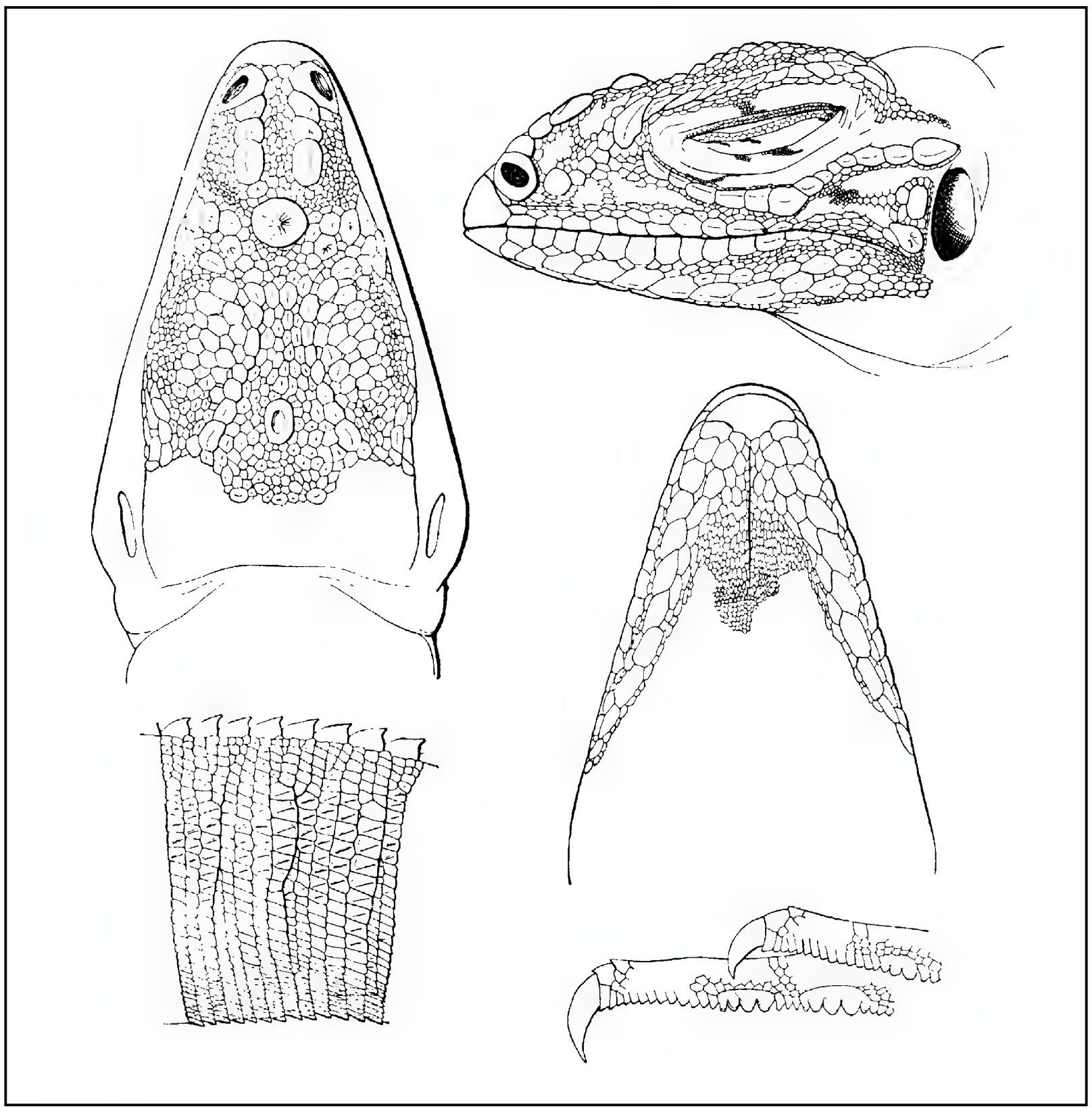

BULLETIN OF THE CHICAGO HERPETOLOGICAL SOCIETY
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Half-time Herping on One Big Prairie . . . . . Stephen R. Johnson 65

Notes on the Herpetofauna of Western Mexico 8: Diet Items of the Zacatecas Night Lizard, *Xantusia sanchezi*, in an Oak Forest of Jalisco, Mexico . . . . . Daniel Cruz-Sáenz, José Luis Ortega de Santiago and David Lazcano 67

Frog City: V. A Green Thought: Part 1 . . . . . Ilene Sievert 70

What You Missed at the April Meeting . . . . . John Archer 72

Herpetology 2013 74

Advertisements 76

Cover: Young Mona Island iguana, *Cyclura cornuta stejnegeri*. Drawings (as *Cyclura cornuta*) from *The Herpetology of Porto Rico* by Leonhard Stejneger, Annual Report of the United States National Museum for 1902 (issued in 1904).

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Half-time Herping on One Big Prairie

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Konza Prairie Biological Station just a ten minute drive from Manhattan Kansas is a 3,487 hectare tallgrass prairie managed by Kansas State University. I was there to study the effects of fire on freshwater cordgrass (*Spartina pectinata*) dominated wetlands, and while I had this landscape available to me I spent countless hours on it from spring through fall and even some winter days. While my major focus was plants, I've always had an abiding interest in herps and on KPBS I found them or they found me.

Access to research sites is usually provided by wide and well mowed fire breaks that occur between all of the KPBS fire treatments. It wasn't uncommon to round a corner or crest a hill and find an ornate box turtle (*Terrapene ornata*) proceeding on the same trail headed towards me. But as I became more familiar with the wetlands, I found more turtles there. Particularly during summer heat I found turtles resting on cool moist marsh muck beneath low density cordgrass culms, reminding me of diamondback terrapins (*Malaclemys terrapin*) I had seen in the shadows of saltmarsh cordgrass from when I was a master's degree candidate on the Virginia Barrier Islands. Late on a very warm July evening I was walking by the margins of a wetland looking for any new or strange plant or animal phenomena when I noticed a tiny and bright red point of light emanating from the brown muck. On close inspection I saw that it was the reflection of sunset light on the eye of a box turtle intently fixed on me as it was buried up to its chin in the marsh.

Another herp I found in the cordgrass wetlands was Cope's gray treefrog (Heinrich and Kaufman, 1985). The seminal paper by Jaslow and Vogt (1977) suggests that Cope's gray treefrog (*Hyla chrysoscelis*) is the most likely candidate for open prairie habitat. I found the first frog by accident while I was sweep netting for insects associated with freshwater cordgrass and after sequentially releasing seven grasshoppers, I was surprised to find that what I thought was the eighth grasshopper had a recognizably vertebrate face. I almost wildly threw the net aside but fortunately realized it was the face of a treefrog. When I related this encounter to the K-State herpetological experts, I was surprised to hear them say that treefrogs didn't frequent the typically dry cordgrass wetlands and only ventured to open water to breed and otherwise foraged in the gallery forests on Konza. Despite those assurances I continued to find treefrogs in the wetlands most often on the broad leaves of common milkweed. Cope's gray treefrog is probably the only member of the genus *Hyla* to occur on Konza where it is near the western limit of its range (Hillis et al., 1987; Conant and Collins, 1991; Bartlett and Bartlett, 2006). Cope's gray treefrogs were only found in the *Spartina* wetlands in the spring, their appearance coincidental with the flowering period of common milkweed (*Asclepias syriaca*) a frequent plant in these wetlands. During their flowering period milkweeds attracted many different species of flies in fairly high numbers and those in turn attracted several kinds of spiders. This invertebrate diversity no doubt attracted the occasional Cope's gray treefrog (Freed, 1982).

Another and unique encounter with a Cope's gray treefrog occurred while I had my camera along on an investigation concerning a female jumping spider (*Phidippus princeps*) as possible mimic of milkweed flowers. I noticed a dark shape on a low and deeply shaded milkweed leaf that on closer inspection turned out to be another treefrog. What made this individual unique was that it was a very close approximation in both body coloration and pattern to a Pine Barrens treefrog (*Hyla andersonii*). While the resemblance to *Hyla andersonii* was uncanny, the frog was clearly a Cope's gray treefrog displaying tuberculate skin rather than the smooth skin associated with *H. andersonii* (Cope, 1889; Conant and Collins, 1991). Furthermore the pale margin along the lateral body and legs is rough rather than smooth as in *H. andersonii* and there is pale flecking on the hind foot not associated with *H. andersonii*. The dark coloration extending from nare through the eye and to the shoulder is either black or very dark gray while the same area on *H. andersonii* is purplish brown to lavender (Conant and Collins, 1991; Dickerson, 1906). Had Cope found this specimen, he would perhaps have considered it a distinct variety. He did name other varieties such as *H. versicolor phaeocrypta*, no longer recognized. This particular frog is likely far more distinct from the typical *H. chrysoscelis*.

In the wide expanses of the tallgrass prairie, snakes can be highly elusive. Typically I only heard a swishing sound through grass culms sometimes accompanied by the sight of a rapidly exiting length of snake. I found the best time to see relatively immobile red-sided garter snakes (*Thamnophis sirtalis parietalis*) was a narrow window of time in early spring very soon after a controlled burn. The first time I encountered one I walked past a large elevated burned off culm of big bluestem and a snake was there was just on the other side. We surprised

one another. Later in the season I might occasionally see a red-sided garter snake gliding apparently effortlessly through dense grass stands, and since I was upwind I could observe it for a while. Only once I saw an approximately 3-foot-long black rat snake (*Elaphe obsoleta obsoleta*) glide up a small conical hill just east of the *Spartina* wetlands.

I was with several other graduate students one October afternoon when one of them found a single lethargic specimen of a Texas horned lizard (*Phrynosoma cornutum*). It was by an abandoned limestone cistern once used as a cattle trough. The coloration of this lizard was an exact match for the limestone rim of the cistern and together with the shape and lethargy, the lizard matched the surrounding jagged limestone rocks that littered the uplands.

Several times I went to limestone and chert strewn uplands fields and I lifted slabs. Typically spaces under slabs were vacant. On one occasion I lifted a slab to find a western slender glass lizard (*Ophisaurus attenuatus attenuatus*) and twice found prairie ringneck snakes (*Diadophis punctatus arnyi*).

The most commanding herp I found while traversing the margins of a small stream on Konza searching for rare or unusual aquatic plants. In a wide bow of the stream I saw what appeared to be a small sand-colored boulder covered in long waving strands of green algae. I marveled at how this boulder seemed so round and smooth when I noticed that the head of the common snapping turtle was noticing me! This behemoth must have been nearly as long as the19 and 3/8 inch record described in Conant and Collins (1991).

Until I left Konza Prairie, I continued to occasionally find Cope's gray treefrogs in the wetlands despite the experts' dismissals. Though I found no additional treefrogs resembling *H. andersonii* in the *Spartina* wetlands, my small sample size with sporadic sampling does not preclude the existence of this hypothetical variety.

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Notes on the Herpetofauna of Western Mexico 8: Diet Items of the Zacatecas Night Lizard, *Xantusia sanchezi*, in an Oak Forest of Jalisco, Mexico

Daniel Cruz-Sáenz [1], José Luis Ortega de Santiago [2] and David Lazcano [3]

Abstract

As part of an investigation into the ecology and biology of *Xantusia sanchezi*, excreta were collected with the aim of studying the diet of the species. Samples were analyzed by identifying the structures useful for taxonomic determinations. We identified remains from four orders of insects. Within two of the orders we could identify the family and within one family we were able to distinguish six species.

Resumen

Como parte de una investigación sobre la ecología y biología de *Xantusia sanchezi* se realizó la colecta de excretas de estas lagartijas con la intención de conocer sobre los elementos que constituyen la dieta de esta especie. Se analizaron las muestras realizando la identificación de las estructuras para conocer a cual grupo de organismos pertenecen. Logrando identificar a cuatro ordenes, dos familias y seis especies de insectos.

Introduction

Determining the diet of a species yields important information about adaptations to its habitat that can be useful in management and conservation strategies for the species.

Brattstrom (1952) reported on the diet of species of night lizards (*Xantusia*) in the U.S. He found ants, beetles and spiders constitute the principal items in the diet of these species.

Lizards tend to be predominately insectivorous or herbivorous. The species eaten depend on the foraging behavior mode and can predict the relationships between the relative abundance of food items and a forager's selectivity (Stamps et al., 1981). Some lizards have adapted to eating ants (Smith, 1946; Pianka and Parker, 1975; Sherbrooke, 1981; Montanucci, 1989; Blackshear and Richerson, 1999).

Study site

With its topographic, orographic and climatic diversity, the state of Jalisco provides an extensive range of habitats that contribute to its rich biological diversity. The state harbors 13 different plant communities, with tropical deciduous forest (*bosque tropical caducifolio*) covering 19.6% of the surface area and oak forest (*bosque de encino*) covering 18% (Rzedowski and McVaugh, 1966; Flores-Villela and Gerez, 1994).

The evergreen oak forest community is composed of the following tree and shrub species: *Bursera multijuga* (elephant tree); *Bursera penicillata* (Indian-lavender); *Bursera kerberi*; *Vitex pyramidata* (*negrito*); *Quercus resinosa* (*encino bermejo*); *Quercus magnoliifolia* (*encino amarillo*), *Quercus subspathulata* (*encino mixcahue*); *Lysiloma acapulcense* (*huáyal*); *Leucaena macrophylla* (*guaje verde*); *Clethra rosei*.

The tropical deciduous forest community comprises the following species: *Bumelia persimilis* (*naranjillo*); *Bursera bipinnata* (*copal santo*); *Bursera copallifera* (*copal*); *Bursera grandifolia* (*palo mulato*); *Bursera kerberi*; *Bursera penicillata* (Indian-lavender); *Bursera schlechtendalii* (*copal negro*); *Ceiba aesculifolia* (*pochote*); *Euphorbia tanquahuete* (*mociño*); *Jatropha cordata* (*torato*); *Leucaena esculenta* (*guaje*); *Lysiloma acapulcense* (*huáyal*); *Pseudobombax palmeri*; *Sideroxylon capiri* (*danto amarillo*); *Stenocereus queretaroensis* (Querétaro tree cactus). Many of these plants have different common names depending on the location.

Huaxtla is located in northern Jalisco, UTM 667929, 2316292, at 1213 m above sea level. Situated within the municipality of Zapopan, 20 km northwest of the metropolitan area of Guadalajara, this site is accessed by the Federal Highway # 23 to Colotlán. Mountains here form part of Sierra de San Esteban; dominant vegetation is oak forest, with some patches of tropical deciduous forest on a few slopes and in ravines.

The fauna of Huaxtla comprises six species of amphibians and 20 species of reptiles (Cruz-Sáenz et al., 2008), 34 species of birds (Maya-Elizarrarás et al., 2008) and 20 species of mam-

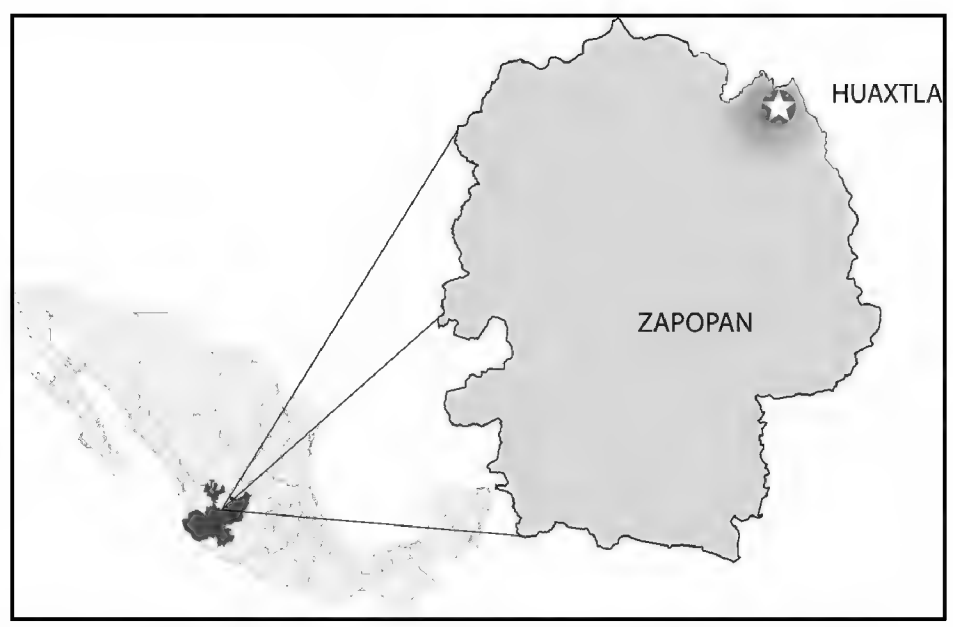

Figure 1. Location of study site, Huaxtla, Zapopan, Jalisco, Mexico.

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Figure 2. Parts of the head, mesosoma, legs and gaster of *Pheidole* sp.

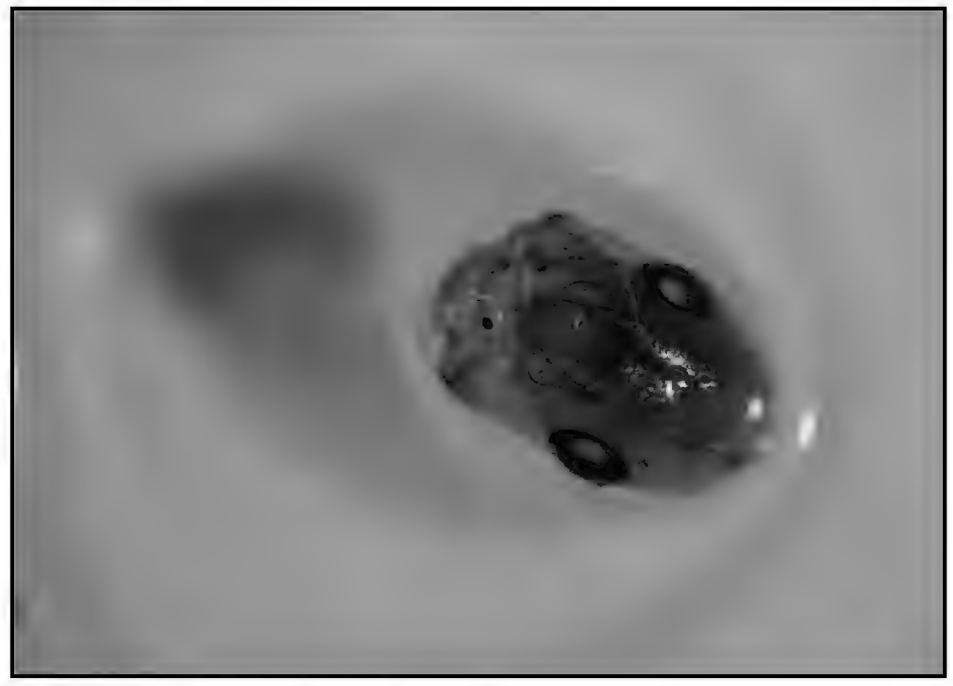

Figure 3. Head of *Pheidole* sp.

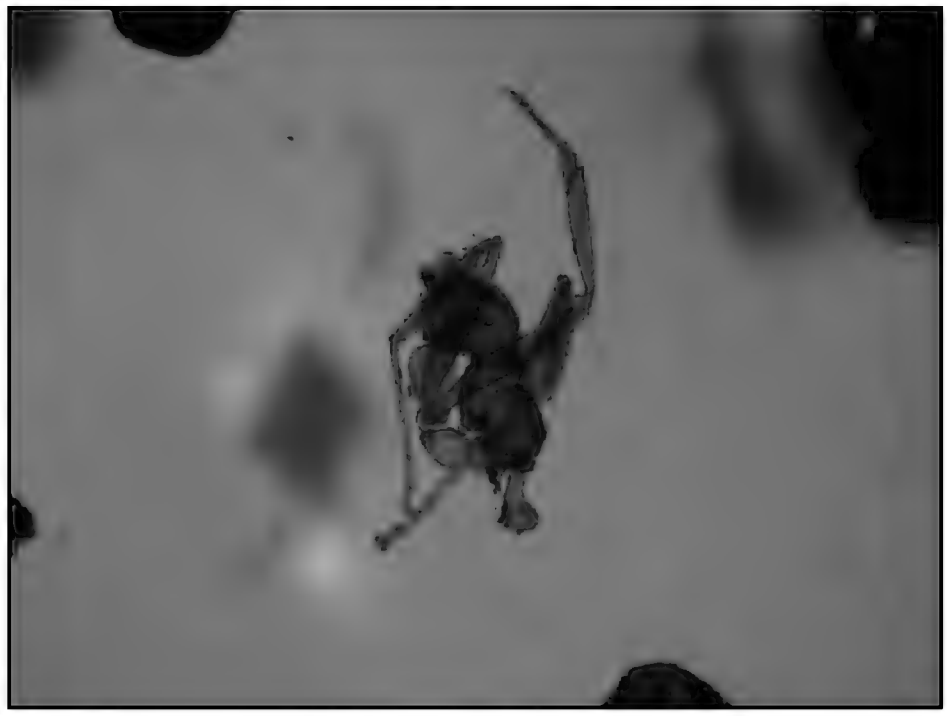

Figure 4. Mesosoma with legs and petiole of *Pheidole* sp.

Figure 5. A specimen of *Xantusia sanchezi* in a rock crevices area.

mals (Godínez-Navarro et al., 2008).

Materials and Methods

We collected 15 excreta from 15 individuals of *Xantusia sanchezi* inside the crevices they inhabit and stored them in plastic bags. In the laboratory identification of prey parts was conducted with the use of a Carl Zeiss Stereomicroscope Stemi DV4.

Results

The analysis of the samples identified four orders of insects. Within two of the orders we could identify the family. From within the order Hymenoptera we could distinguish six species of ants of the family Formicidae: three species of the subfamily Myrmicinae, genus *Pheidole*, and three species of the subfamily Formicinae, genus *Camponotus*.

Table 1. Insect taxa identified from samples of excreta of the Zacatecas night lizard, *Xantusia sanchezi*.

Order Hymenoptera	**Order Coleoptera**	**Order Orthoptera**	**Order Dermaptera**
Family Formicidae Subfamily Myrmicinae *Pheidole* sp. 1 *Pheidole* sp. 2 *Pheidole* sp. 3 Subfamily Formicinae *Camponotus* sp. 1 *Camponotus* sp. 2 *Camponotus* sp. 3		Family Gryllidae	

Table 2. Taxa and structures that determined the taxa.

Taxa	Structures
Coleoptera	Elytra
Camponotus sp. 1	Head and mesosome
Dermaptera	Head and thorax
Pheidole sp. 1	Mesosome
Pheidole sp. 2	Mesosome
Pheidole sp. 3	Mesosome
Gryllidae	Legs, wings and others
Coleoptera	Elytra and fragments
Camponotus sp. 2	Head and mesosome
Camponotus sp. 3	Fragments
Pheidole sp. 1	Mesosome, gaster and antenomeres
Coleoptera	Pronotum and elytra
Pheidole sp1	Mesosome, gaster and head
Coleoptera	Elytra
Orthoptera	Mandible
Pheidole sp.	Head and mesosome
Coleoptera	Elytra and fragments

We could not identify the fragments of some samples to species level because they were in an advanced state of digestion.

Conclusions

Night lizard species are extremely secretive. Although their elliptical pupils suggest that they are nocturnal, they are diurnal to crepuscular and seldom venture into the open. They forage slowly in and under ground litter, rock crevices or tree bark. Whether desert or forest inhabitants, all are probably sedentary and may have home ranges of only a few square meters. All are carnivores (= insectivorous) and consume a large variety of arthropods. There is slight variation among species.

Little is known of the biology and ecology of *Xantusia sanchezi*, but the available data are consistent with those on other xantusiids.

Here we document part of the diet of *Xantusia sanchezi*, which we found to feed on ants of the family Formicidae and on Coleoptera that could not be identified to family.

Our findings are limited to excreta from rock crevices. Perhaps individuals in bark crevices and other habitats prey on different insects. We hope to obtain an Extech Instruments Video Borescope Model BR200 to increase our number of samples. Night sampling is out of the question due to lack of security.

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In fond remembrance of Ilene Sievert, who died December 16, 2012, this year we will reprint several of the essays that Ilene wrote for these pages between 1988 and 1993 under the rubric "Frog City." This one is from February 1990.

Frog City
by Ilene Sievert

V. A Green Thought: Part 1

The teacher called me at work. All mothers dread this call.

"The school nurse must talk to you about Carolyn."

"Mrs. Sievert, your daughter has been bitten on the lip; come pick her up."

Bitten? Bitten on the lip in an Evanston elementary school? Perhaps she encountered a precociously amorous but unskillful swain? No. She was bitten on the lip by a school pet, a green "chameleon," an anole.

Maternal brain waves performed figures unknown to mathematical description as I sought a productive approach to questioning the nurse.

"A chameleon is a tiny lizard, is it not?"

"Yes."

"I mean, really small, only two or so inches of body?"

"Yes."

"How did it get to her lip?"

"I was not present at the incident. The classroom teacher brought her in."

It is possible that a school nurse grows to be surprised at nothing and loses all curiosity about the bizarre and violent acts swirling about her.

"How much of a wound," I said slowly with careful enunciation and full stop after each word, "how much of a wound can a tiny lizard make on a human lip?"

"There is some blood and she cannot return to the classroom." A brusque quality invaded the previous flatness of her tone and she was not amused.

"Please put Carolyn on the phone if she is able to speak," I said.

"Mom?"

"How, pray tell, did a chameleon bite your lip?"

"Well, Mom...I was kissing it."

I briefly tried the nurse on returning the child to class or sending her home, just around the corner from the school. No on both --- some legal impediment involving school responsibility. Since the fastest immediate dash from downtown Chicago brought me back after 3 P.M., Carolyn sat in the nurse's office the remainder of the day with this instruction; to ponder her own reaction if a huge toothy lizard were to lift her face to its mouth. The nurse closed the conversation with stern advice: take her to the doctor ASAP. So, I drove home in a mixed state of comical anxiety. In imagination I saw my daughter in her garrulous old age, at the Safari Club, telling once again the adventure of how she got her lizard wound. Or she is on the table in the medical theater as a specialist points out green scaly excrescences to students of rare tropical disease. Perhaps this is the beginning of "The Little Green Reptiles" by Alfred Hitchcock, or a science fiction tale, "Revenge of the Reptoids." A headline screams, INNOCENT ADORABLE CHILD DIES OF HORRIBLE REPTILE MUTILATION WHILE SMIRKING MOTHER DELAYS MEDICAL AID. Well, maybe that's too long to actually scream.

When I finally got home there was a close inspection of the offended lip using flashlight and magnifying glass. All that could be found was a solitary red mark, a pin prick, that may or may not have been an anole bite. For lack of anything else to do, the pediatrician was called. Pediatricians, even more than school nurses, have learned not to be easily surprised. He cautiously, and without giggle or snort of any kind, recommended careful observation and bring her in if there is swelling.

Fortunately there was no swelling, pain, or green scaly rash, but we did manage a long discussion on loving lizards and being loved in return. Perhaps this was a good time for some reality training about animals. The child had an unclear distinction between her own feelings and those of creatures of another species. If she loves to squeeze a hamster it must love to be squeezed. She squeezed it no harder than she herself liked to be squeezed. And, since she loved the little green lizard, a kiss must be mutually agreeable. It was disturbing to think my own child might be an abuser of helpless animals.

Perhaps, I thought, a little observation of these anoles under proper care would help teach what sort of treatment truly made animals happy. How much, O Socrates, I do not know about what I do not know! A pre-parturient experience trying to make a domestic cat out of one stubborn specimen of *Mephitis mephitis* should have taught me wild animals are not easily molded to human expectation. Two infants later, I was not much wiser.

Green flesh is cheap. It's easy to buy a green anole; most pet stores have them any time of year. We put a few in a screen top aquarium with some sand, dead branches, and plastic plants. There was no water bowl and the cage was misted once or twice a day—a very dry environment. Some mealworms were put to petrify in a jar lid and an incandescent bulb was burned above for heat and additional desiccation. There may have been both sexes present but we saw no courtship, no eggs. Aside from some fighting of two individuals, they did nothing but sit, look ugly, and slowly dwindle. One by one they shriveled and died, starting with the chronic loser in the fight for top branch. It took a year, which was, for all we knew, a respectable anole life span.

It did not seem a happy year.

The child observed misery and ill-health, and so did I. We forgot about them for years, except, if someone casually expressed interest in acquiring a pet "chameleon" we said, Oh, they're not so easy to keep. Ours died.

Later one early spring we made the pilgrimage to Disney World in Florida. At a nearby tourist attraction featuring an alligator farm I escaped alone to a short hiking trail at the rear of their grounds. It was labeled "jungle walk." In addition to the delight of ditching my family and other tourists on this totally deserted path, there was hope of spying some interesting native plant material (bo-ring Mom). Actually, I'm so ignorant of native subtropicals that, truth to tell, it's happiness just to see something unfamiliar, something not hardy in the Midwest. Never mind if it came from further south or the Old World, an escaped cultivar or cross. Tickle me with tillandsias: mangle me with mangos.

Gazing in at bromeliads on mossy trunks my eye caught a small scampering movement. A rodent? No, it was green, a green lizard, an anole. This was as shocking as the first observation by a city kid of a cow actually being milked. Sure, they tell you milk comes from cows. Yeah, yeah. Actually it comes in plastic or waxed paper, or, in olden times, glass. It doesn't hit home till you see that milky udder. In the same fashion I knew that lizards actually lived in natural environments in the wild.

Down the vertical trunks that live green thing zipped in morse-code dashes and then it ran up a broad leaf of grass or sedge not six feet away. It was a wonder it didn't run into my wide open mouth. I could see the little toes overlapping the green blade. It was shimmering, glowing green, and it cocked one brave and brilliant eye at me. If you're hiding from the hot bright gaze of Judgment, look down and receive its reflected ray from the small eye of a lizard. Here is how little green lizards should be; bold yet wary against harm in the mixed daylight; blending color and form with leaves and grass. Is this the environment anoles prefer, moist earth and green vegetation, changing light and shadow? A jewel is finer in the setting for which it was designed. Please, please, I said to myself, try to remember this.

To be continued

INTERNATIONAL
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Bull. Chicago Herp. Soc. 48(5):72-73, 2013

What You Missed at the April Meeting

John Archer
j-archer@sbcglobal.net

Fifteen minutes into the presentation the screen froze. No amount of coaxing from the A/V gang made any difference and it looked as though Dan Krull would have to carry on without the aid of visuals. Which he did. He continued the talk with hardly a pause, throwing in a brief history of the other failures he'd experienced in the past. We eventually discovered the problem, or more correctly, Dan discovered the problem, and we were able to enjoy the rest of his talk as he had meant it to be experienced. It's no surprise that he handled it easily. Dan is an on-camera talent for Herp Nation Media (HerpNation.com) and hosts the Dan Krull Show on Herp Nation Radio. He's also a really good field herper and photographer, a captive breeder, environmental consultant, and videographer. His talk was titled "Citizen Science: A Volunteer Army."

Dan Krull. Photograph by Dick Buchholz.

He first gave us a little history lesson. Side by side photographs of a coral snake next to a milksnake, a massasauga and western hognose, a bullsnake and rattlesnake, and a gray-banded kingsnake and rock rattlesnake were shown as he asked what we were looking at. Being a sharp audience, we answered Batesian mimicry. We saw a portrait of Henry Walter Bates flanked by *Heliconius* butterflies and their mimics, the animals that first led Bates to suggest that harmless species might mimic toxic or venomous species. We learned that when Bates arrived home after 11 years in the Amazon he had sent back over 14,712 species, 8,000 new to science. Dan related that Bates had no formal education, but studied and collected insects in his spare time. He supported his research in the Amazon by selling collected specimens to museums and individual collectors, a practice common in the 1800s. In spite of his extensive studies in the Amazon, Bates was not taken seriously by academics. He sold specimens, had no formal training, and frequently told the academics they were wrong, but gradually his views were accepted as they proved to be correct. Dan pointed out the huge gap in knowledge that lies between observing animals in the field and observing a preserved specimen scooped from a jar. And he asked, "What is the point of scientific discovery?"

His answer was we don't know what we don't know. To demonstrate that point, he showed a slide of a virus and proceeded to relate the tale of a mysterious disease that killed 45 people over three years in the Four Corners area of the southwestern U.S.

In 1993 the Centers for Disease Control and Prevention (CDC) sent a team to discover the nature of this disease. They discovered the virus was a hantavirus and a member of that team, Terry Yates, found the vector for the virus was *Peromyscus*. Hantavirus had been circulating in the rodent population for many years, but this was the first time the virus had infected humans. The CDC wanted to know what caused the sudden jump to humans. If this virus had recently mutated so that it was infectious to humans, the results could be catastrophic. Fortunately, the U.S. Fish and Wildlife Service had been doing long-term studies of the rodent population in that area, including collecting and preserving specimens. Dan wanted to stress that these studies had no immediate or obvious payback as they were being conducted, but by analyzing the virus in the preserved specimens, the CDC confirmed that the virus had not mutated. The outbreak among humans was linked to an increase in the population of the rodents and the resulting greater contact between humans and the mice, or more exactly, the waste products of the mice. As a result, protocols were established that drastically decreased the incidence of the disease. Dan emphasized that without the seemingly pointless study of the *Peromyscus* in the first place, the CDC would have had a much more difficult time fighting the disease.

A slide of Darwin appeared on the screen and Dan used Darwin to illustrate the driving force behind most scientists,

Lampropeltis alterna and *Crotalus lepidus*. One of Dan Krull's examples of Batesian mimicry. Photographs by Dan Krull.

One of Dan's favorite discoveries. A huge central plains milksnake, *Lampropeltis triangulum gentilis*, one of only five found in Grant County, Kansas. Photograph by Dan Krull.

curiosity. But more than curiosity is needed; money is needed. The researcher of today usually needs an upper level degree, institutional affiliation, and funding for research, collecting of specimens, running DNA tests, lab work, and assistants. And still be able to eat and pay personal bills. All of that requires money, and if one is not personally wealthy as was Darwin or able to sell specimens like Bates, one has to find funding for basic research. The National Science Foundation is responsible for approximately 20% of federal funding going to research conducted by colleges and universities. The next slide showed an array of corporate logos from oil companies to drug manufacturers. Dan asked what they all had in common. His answer, illustrated by a slide he swore was two dogs playing and only looking like they were viciously assaulting one another, was that they all "had a dog in the fight." They need predictable and profitable results on a "hot" topic that is germane to their mission. They are not interested in science for science's sake.

So Dan had given us strong examples of amateurs doing real science, the need for conducting research that has no apparent payback, and the lack of funding for that type of research. Where was he headed? Photos of Joe Collins appeared, followed by the opening slide of Dan's talk, showing a crowd of people. Joe Collins is a hero of Dan's. Joe founded the Kansas Herpetological Society in 1972 and throughout his life spread his interest in reptiles and amphibians by his writings, talks and enthusiastic involvement of people in his passion. Dan expanded the view again and again until the photo encompassed about a hundred people that were on the 2012 spring field trip of the Kansas Herpetological Society. The crowd was 80–95% laypersons of all ages. They were participating in one of the two or three field trips that the KHS sponsors each year targeting specific understudied areas and collecting thousands of data points that are evaluated by researchers and presented as papers in an annual meeting of the KHS. Researchers provide direction, targets, tools, and interpret the data. The amateur herpers pay for gas, lodging, and food, and collect data and specimens. One result, Dan asserts, is one of the best, most complete state field guides in the country: *Amphibians, Reptiles, and Turtles in Kansas*.

Since 1972 the KHS has been conducting these trips and Dan said that as a result, no other state's herp population has been as thoroughly studied as Kansas's. While Dan encouraged us to participate in the KHS trips, he gave us other ways to participate in citizen science, providing two examples of amateur herpers who were able to pursue projects that had real impacts. One even led to a job doing herp research in Guatemala.

The term citizen science seems to be mentioned more and more often by our speakers. Will Bird and Phil Peak, Gerry Salmon, Dusty Rhoads, and Jeff Lemm are just a few who have mentioned the importance of citizen scientists. Using amateurs as data collectors and contributors to research can provide additional resources for chronically underfunded amphibian and reptile studies. Dan admitted that some professionals will never accept amateurs into their projects, but emphasized that for those that do, the returns are often generous. And for the amateurs the rewards can also be great, such as access to restricted areas, interactions with protected animals, and the chance to make a difference. Professionals that need bodies and funding and herpers who enjoy working with the animals, seems as though that's a formula which can lead to everyone being happier. Dan's message: get out there and participate. You're needed.

Herpetology 2013

In this column the editorial staff presents short abstracts of herpetological articles we have found of interest. This is not an attempt to summarize all of the research papers being published; it is an attempt to increase the reader's awareness of what herpetologists have been doing and publishing. The editor assumes full responsibility for any errors or misleading statements.

FLORIDA PINE SNAKE HABITAT USE

G. J. Miller et al. [2012, Copeia 2012(4):706:713] note that recent reports of declines in terrestrial snake populations in the southeastern U.S. have highlighted the need for life history information for these often cryptic animals. This study used radio-telemetry to describe home range size and habitat use of the Florida pine snake (*Pituophis melanoleucus mugitus*), a large fossorial species associated with the endangered longleaf pine (*Pinus palustris*) ecosystem. Florida pine snakes had large home ranges that varied in size among individuals (mean = 59.2 ± 50.8 ha, minimum convex polygon). There was no significant difference between mean annual home range size of males and females, but home range size differed significantly among seasons and between males and females by season. At the home range scale, Florida pine snakes selected natural pine forests and mature slash pine plantations, and they tended to use sites with shrubs and vines and very little bare ground at a local scale. As has been observed in other studies, Florida pine snakes were highly fossorial and they frequently sought shelter in Southeastern pocket gopher (*Geomys pinetus*) burrows. Snakes in this study rarely crossed paved or graded dirt roads; however, they frequently crossed low-use harrowed dirt roads. Collectively, these findings indicate that Florida pine snakes require large contiguous pine forests and that paved and graded roads may be significant barriers to their movement.

FEMALE PREFERENCES NOT CHANGED BY EARLY EXPERIENCES

B. Dawson and M. J. Ryan [2012, J. Herpetology 46(4):535-538] note that female mate choice preferences may be the result of innate factors, experience, or an interaction between the two mechanisms. Understanding the relative contribution and possible interaction between these mechanisms is important for identifying sources of variation in behaviors under sexual selection. This study evaluates the contribution of early experience on the development of mate choice preferences in Neotropical túngara frogs, *Physalaemus pustulosus*. Frogs were reared from tadpole stage through sexual maturity in four acoustic treatments: the first group heard a conspecific chorus of túngara frogs, the second group heard a heterospecific chorus of the closely related sympatric congener *P. enesefae*, the third group heard no frog sounds, and the fourth group heard only broadband white noise. At sexual maturity, the authors tested each female's preferences for conspecific complex vs simple calls and discrimination against calls of the sympatric congener. Female choices in all of these tests were consistent with those in previous studies of wild-caught and laboratory-reared specimens of this species. The acoustic rearing environments in this study did not alter the preferences of females for complex conspecific calls or the discrimination of females against the sympatric congener. This study supports the hypothesis that early experience does not alter the mate choice preferences of female *P. pustulosus*.

REED CANARYGRASS AND GARTERSNAKES

J. M. Kapfer et al. [2013, J. Herpetology 47(1):126-130] note that research that investigates the impact of invasive plants on reptiles, particularly snakes, is sparse. Butler's gartersnake (*Thamnophis butleri*) is a rare snake, endemic to the upper midwestern United States. Little research has focused on the habitat selection of this snake, which is often sympatric with the common gartersnake (*Thamnophis sirtalis*). The highly invasive wetland grass *Phalaris arundinacea* (reed canarygrass [RCG]) has become established or dominant throughout much of the geographic distributions of these snakes. The impacts of this invasive grass on the habitat selection of *T. butleri* and *T. sirtalis* have not previously been examined. During 2 yr of drift fence surveys at three survey sites and five habitats sampled in southeastern Wisconsin, the authors captured 243 adult *T. butleri* and 311 adult *T. sirtalis*. *Thamnophis sirtalis* was found more often in RCG than *T. butleri*, which appeared to have more specific habitat needs and most often occurred in upland habitats, particularly grassland, rather than wetlands. These findings have important regulatory and conservation implications for the globally rare *T. butleri*. For example, the data support the importance of upland habitat protection as part of conservation strategies for *T. butleri*. In addition, management of wetland habitat for this species must consider the impact of RCG and direct habitat restoration strategies accordingly.

HELLBENDER SHELTERS

C. R. Rossell, Jr., et al. [2013, J. Herpetology 47(1):66-70] investigated the attributes of shelters used by eastern hellbenders (*Cryptobranchus alleganiensis alleganiensis*) in two 500-m stretches of the French Broad River basin in North Carolina during June 2010. They quantified attributes at each hellbender shelter and at a corresponding unoccupied shelter located <25 m away to determine whether the attributes selected differed from those available in the surrounding environment. Forty-one hellbender shelters were identified, each occupied by a single animal. Hellbenders selected shelters that had larger cover rocks and deeper cavities than the unoccupied shelters. No other attributes differed between occupied and unoccupied shelters, and there were no significant relationships between total length of hellbenders and size of the cover rock or cavity depth. All hellbender shelters were formed by large rocks with flat bottoms. Most had a single entrance that was oriented downstream and a cavity floor consisting of sand and gravel. Shelters were generally located in shallow, fast-flowing water with <10% of their surface area embedded in the substrate. The results suggest that hellbenders prefer shelters with attributes that maximize cavity space. Larger cavities likely provide greater protection from predators and greater concealment from sunlight. In addition, larger cavities allow more space for hellbenders to rock back and forth to maximize oxygen uptake through their skin during periods of low flow when oxygen levels drop.

NOCTURNAL ACTIVITY IN RATSNAKES

J. H. Sperry et al. [2013, J. Herpetology 47(1):105-111] note that nocturnal activity is important for many animals, but difficulty in documenting that activity has hampered efforts to understand factors that influence when animals are active at night. Automated radiotelemetry was used to provide the first detailed tests of the hypothesis that the nocturnal activity of free-ranging snakes should be influenced by temperature, moon phase, and prey abundance. The study subjects were ratsnakes (*Pantherophis* spp.) from Texas and Illinois. The snakes exhibited some nocturnal behavior throughout their active season in both Texas and Illinois, although snakes were much more active at night in Texas than in Illinois. Texas snakes transitioned from primarily diurnal activity to primarily nocturnal activity over the snakes' active season, whereas Illinois snakes were always most active in the middle of the day. For both populations, nocturnal activity was positively related to temperature but unrelated to moon phase. Ratsnakes in Texas exhibited a stepwise increase in nocturnal activity in mid-summer, independent of temperature and coincident with the shift in their diet to almost exclusively mammals active at night. Given the ability of snakes in both populations to be active at night when temperatures allow, warming climates could lead to an increase in nocturnal activity, with consequences for both the snakes and the species on which they prey.

SIAMESE CROCODILES IN LAOS

M. R. Bezuijen et al. [2013, J. Herpetology 47(1):41-65] note that the Siamese crocodile (*Crocodylus siamensis*) is critically endangered and, until a decade ago, few remaining wild populations were known to exist. Described here are the first in-depth surveys for *C. siamensis* in Laos with new field data on ecology and conservation. Small breeding populations of *C. siamensis* are confirmed to persist in Laos. During surveys between 2003 and 2008, *C. siamensis* was recorded in 13 sites of six river systems, where at least 36 individuals (1–11 per site) were documented. In all sites, crocodile densities and recruitment rates were extremely low. Eight nests were recorded—among the first wild nests of *C. siamensis* to be reported. Perennial, thickly vegetated floodplain lakes are critical dry-season refugia and breeding habitats for *C. siamensis* in Laos. Opportunistic collection of crocodiles by local communities was observed, and at all sites there is increasing degradation of floodplain lakes for agriculture or economic development. National crocodile records were compiled and indicate that, historically, *C. siamensis* was widespread in lowland riverine and palustrine habitats of Laos, with most records from Central and South Laos in the Mekong Plain. These records also suggest that a severe range decline has occurred over the past century, although most wetlands remain unsurveyed for crocodiles. *Crocodylus siamensis* is probably now extirpated from the Lao Mekong and many other wetlands. Remnant *C. siamensis* populations in Laos are of global importance. All documented breeding sites, and most confirmed national records, are in rural lands outside the national protected area system, and conservation efforts will require community-based approaches.

NEW SPECIES OF GREEN PALM-PITVIPER

J. H. Townsend et al. [2013, ZooKeys 298:77–106. doi:10.3897/zookeys.298.4834] describe *Bothriechis guifarroi*, a new species of palm-pitviper from Refugio de Vida Silvestre Texíguat in northern Honduras. The new species differs from congeners by having 19 dorsal scale rows at midbody, a bright green dorsal coloration in adults, the prelacunal scale fused to the second supralabial, and in representing a northern lineage that is sister to *B. lateralis*, which is distributed in Costa Rica and western Panama and is isolated from the new taxon by the Nicaraguan Depression. This represents the 15th endemic species occurring in Refugio de Vida Silvestre Texíguat, one of the richest herpetofaunal sites in Honduras, itself being the country with the highest degree of herpetofaunal endemism in Central America. The new species is named in honor of Mario Guifarro, a Honduran conservationist slain in fighting against illegal logging, highlighting the sacrifices of rural activists in battling these issues and the critical importance of conservation in these areas.

TIMBER RATTLESNAKE DIGESTIVE PERFORMANCE

S. J. Beaupre and F. Zaidan III [2012, J. Herpetology 46(4):637-642] note that the analysis of mass and energy budgets provides critical insight for the modeling of both individual organisms and populations. Ectotherms in particular are closely tied to environmental variation because of thermal dependence of most physiological functions. The authors studied the effects of temperature on digestion and growth in 28 timber rattlesnakes (*Crotalus horridus*) from Arkansas, Mississippi and Virginia. They conducted feeding trials in environmental chambers in a repeated-measures design to analyze the effects of three trial temperatures (20, 25, and 30°C) on digestion and growth. No significant temperature effects were found on passage times (average 12.36 days), apparent digestibility (average 87.5%), or metabolizable energy (average 80.6%) across the 10°C temperature range. There was an apparent temperature-dependent trade-off in the allocation of mass and energy to growth in girth versus growth in length. Snakes allocated similarly to body mass at all three temperatures; however, growth in SVL increased significantly from 20°C to 30°C. These observations suggest that snakes at 20°C allocated to increases in girth, whereas snakes at 25°C and 30°C allocated increasingly to increases in body length. The authors estimated the metabolic cost of growth to be approximately 10.5 kJ g-1 dry mass (95 % CI: 6.8–14.1 kJ g-1 dry mass), which corresponds well with previous estimates in ectotherms.

Advertisements

For sale: rats and mice—pinkies, fuzzies and adults. Quantity discounts. Please send a SASE for pricelist or call Bill Brant, *THE GOURMET RODENT*, PO Box 430, Newberry, FL 32669-0430, 352-472-9189, E-mail: GrmtRodent@aol.com.

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Summer Herpetological Field Classes: Research 4 Reptiles, LLC, has openings for ages 12 years to adult for herpetological field classes. Assist in real research studies and learn species identification, capture techniques, and data collection. All classes are limited to 8 individuals and are taught entirely outdoors at pond/prairie sites within Midewin National Tallgrass Prairie in Wilmington, Illinois. Registration details and class information can be found on our website at http://www.research4reptiles.biz. For questions, email Holly Zak at research4reptiles@comcast.net or call 630-337-0757.

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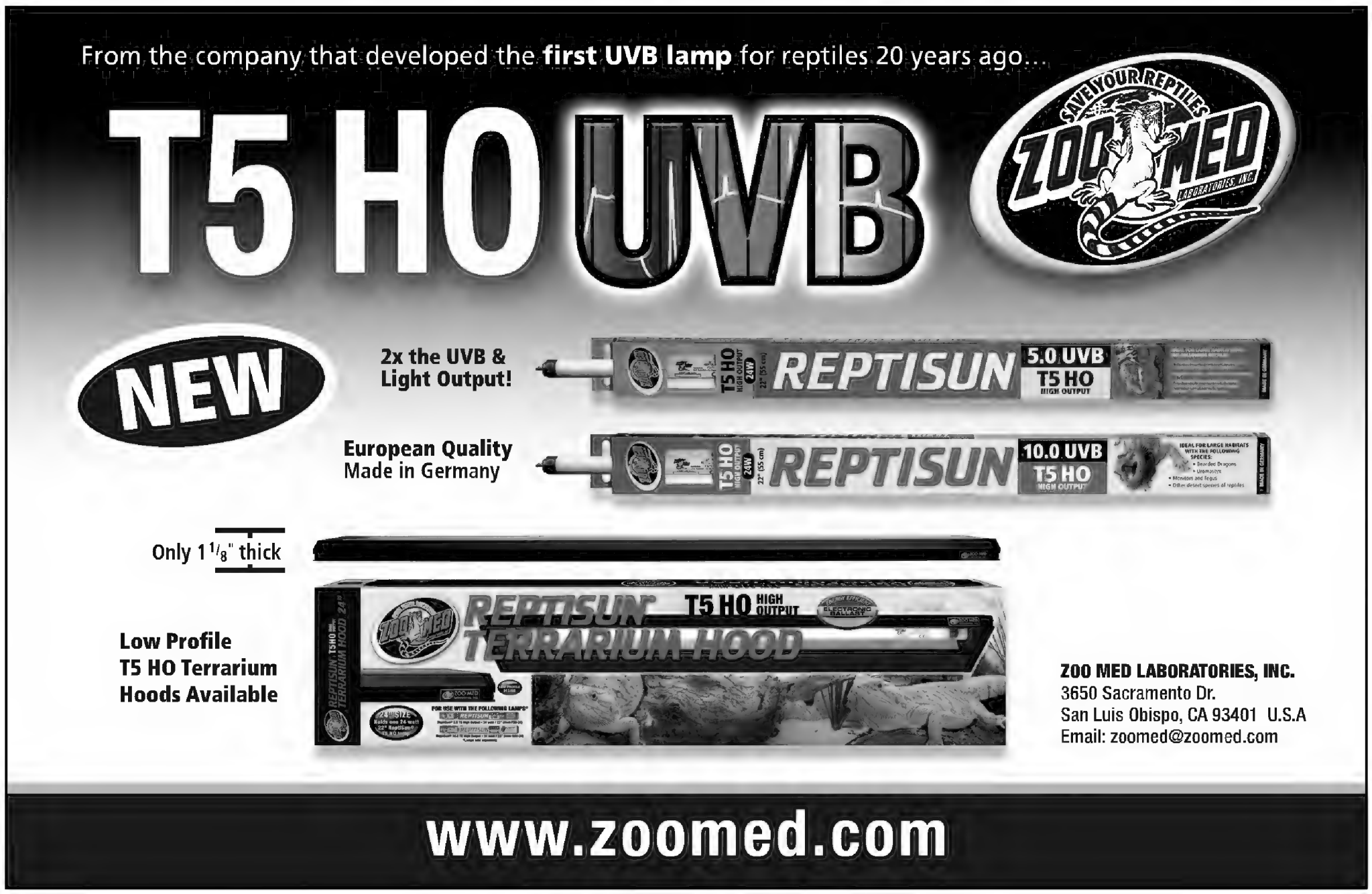
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UPCOMING MEETINGS

The next meeting of the Chicago Herpetological Society will be held at 7:30 P.M., Wednesday, May 29, at the Peggy Notebaert Nature Museum, Cannon Drive and Fullerton Parkway, in Chicago. Our speaker will be **Russ Gurley**, the founder of the Turtle and Tortoise Preservation Group. Russ's talk will not be about chelonians this time, however, but on "Keeping and Breeding Tegus."

The June 26 meeting will be our popular and always well-attended annual **Show & Tell** meeting. Bring an animal that you find interesting for one reason or another and be prepared to give a short (under five minutes) presentation to the group. Don't be shy. Neither age (yours) nor commonness (the animal's) should be a limitation.

The regular monthly meetings of the Chicago Herpetological Society take place at Chicago's newest museum—the **Peggy Notebaert Nature Museum**. This beautiful building is at Fullerton Parkway and Cannon Drive, directly across Fullerton from the Lincoln Park Zoo. Meetings are held the last Wednesday of each month, from 7:30 P.M. through 9:30 P.M. Parking is free on Cannon Drive. A plethora of CTA buses stop nearby.

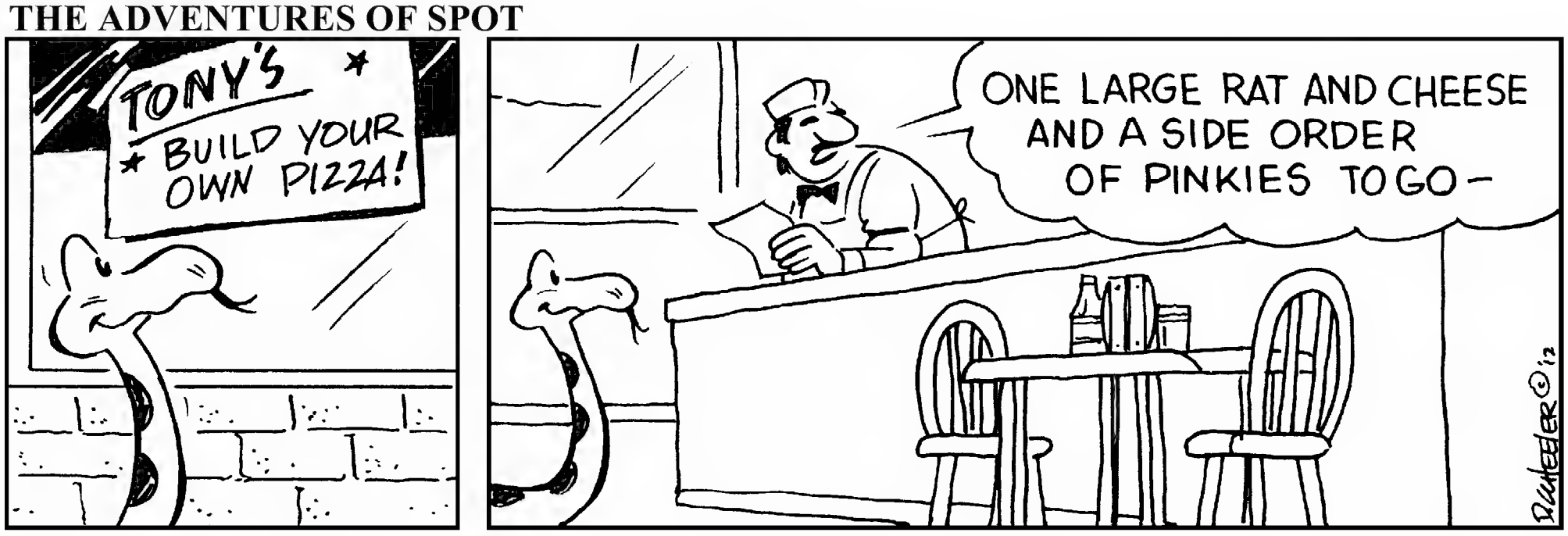
Board of Directors Meeting

Are you interested in how the decisions are made that determine how the Chicago Herpetological Society runs? And would you like to have input into those decisions? If so, mark your calendar for the next board meeting, to be held at 7:30 P.M., June 14, in the adult meeting room on the second floor of the Schaumburg Township District Library, 130 S. Roselle Road, Schaumburg..

The Chicago Turtle Club

The monthly meetings of the Chicago Turtle Club are informal; questions, children and animals are welcome. Meetings normally take place at the North Park Village Nature Center, 5801 N. Pulaski, in Chicago. Parking is free. For more info visit the group's Facebook page.

THE ADVENTURES OF SPOT



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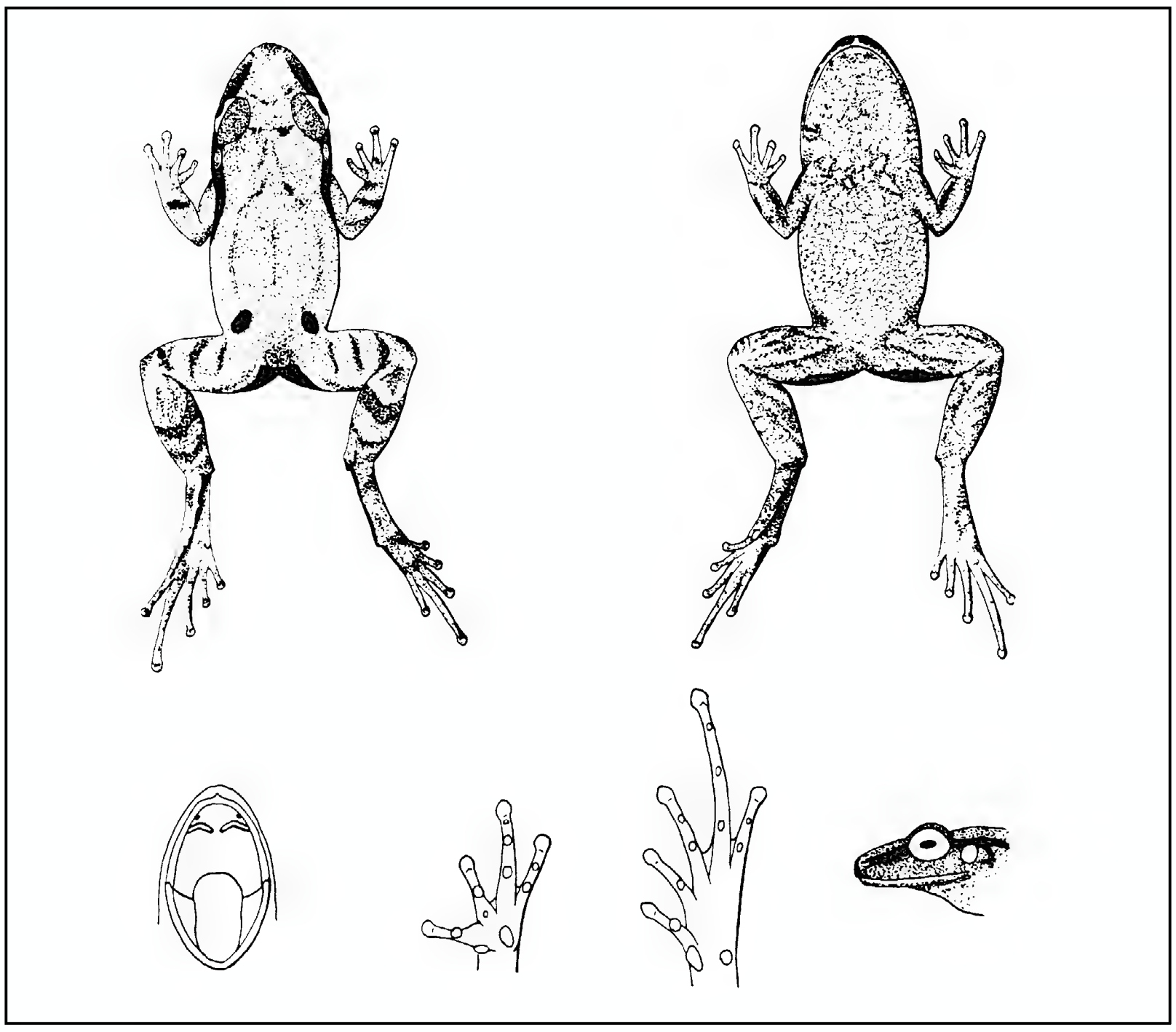

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Volume 48, Number 6
June 2013

Book Review: *The Eponym Dictionary of Amphibians* by Bo Beolens, Michael Watkins and Michael Grayson . . . . . John G. Palis 77

Notes on Reproduction in Long-nosed Leopard Lizards, *Gambelia wislizenii* (Squamata: Crotaphytidae), from Southern California . . . . . Stephen R. Goldberg 79

Frog City: VII. A Green Thought: Part 2 . . . . . Ilene Sievert 83

Herpetology 2013 85

Unofficial Minutes of the CHS Board Meeting, May 17, 2013 87

Advertisements 88

Cover: Jamaican rumpspot frog, *Eleutherodactylus andrewsi*. Drawing from *The Herpetology of Jamaica. I. Amphibians* by W. Gardner Lynn, Bulletin of the Institute of Jamaica Science Series, Number 1, 1940.

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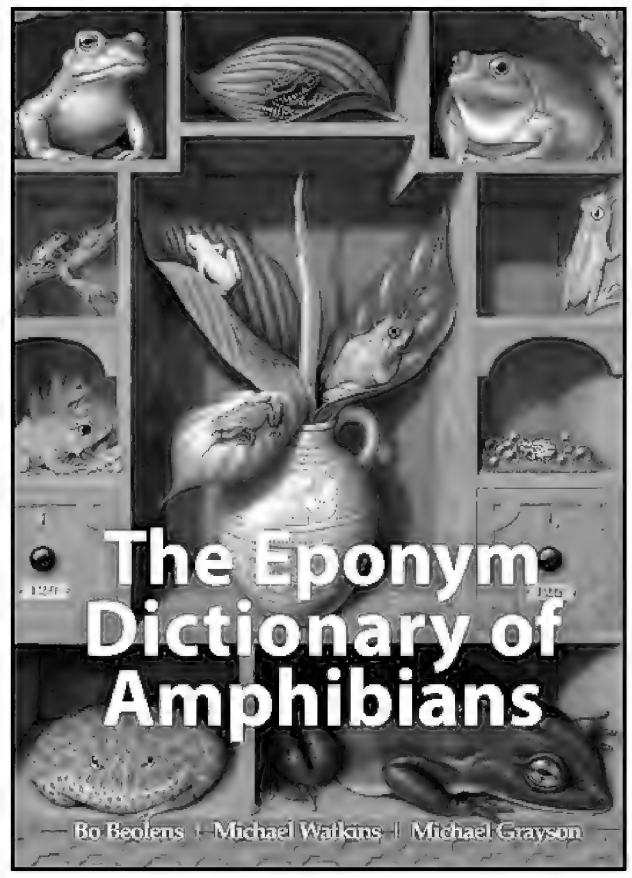
"I expect a review copy of *The Eponym Dictionary of Amphibians* in a few days. Any interest in reviewing it?" This email message from Mike Dloogatch left me wondering, "What's an eponym?" My dictionary defines eponym as "a person whose name is taken for a people, place, or institution, etc." (Ehrlich et al., 1980). The "etcetera" in this case, refers to scientific or vernacular names of biota derived from the names of people. An interesting topic, I thought; I accepted Mike's offer.



The Eponym Dictionary of Amphibians is fourth in a series of books by Beolens and coauthors that explore the eponyms of reptiles, birds, and mammals (Beolens and Watkins, 2003; Beolens et al., 2009, 2011). Bo Beolens, per the book jacket, spends "all his free time . . . birding" and his online monikers include "Grumpy Old Birder" and "Fatbirder." Birds are obviously his passion and birds are where the eponym dictionary series originated. Apparently, once one delves into the topic of eponyms, it's hard to stop. Beolens' coauthors are Michael Watkins, who was a shipbroker for many years, and Michael Grayson, who worked in the British Library and who has enjoyed a lifelong fascination with amphibians and reptiles.

The cover image is a reproduction of an enchanting oil and egg tempera painting by Madeline von Foerster entitled *Frog Cabinet*. The painting depicts colorful and odd-looking frogs from around the world, each housed separately, or in one small group, on shelves of a wooden cabinet. Two closed doors represent frogs not yet discovered and those that may disappear before becoming known to science. It's hard to find fault with the usage of this striking painting as the cover image, except for the fact that there are no salamanders depicted (it is the amphibian eponym dictionary, after all). Readers interested in learning about the artist or viewing her other paintings are encouraged to visit her website (www.madelinevonfoerster.com).

The dictionary is written for "the amateur herpetologist, the student of zoology or anyone else interested in taxonomy, nomenclature or amphibians." It includes the names of 2668 amphibians honoring 1609 individual people. An additional 128 amphibian appellations originate with names that "sound like people's names but are in fact not," and 83 are categorized by the authors as miscellaneous, "relating to indigenous peoples, fictional characters, conservation groups, guerrilla armies, chartered accountants, and biblical and mythological references." The book is an alphabetical listing of eponyms, each followed by one or more names of species named after that person, as well as a brief biographical account of the honored individual. The authors note that tracking down "the provenance of amphibian names" was "fraught with difficulties." They do not, however, provide a description of their methodology (which I would like to have seen), and they warn that "the reader may find that people associated with more recently named species and subspecies are not included in this book." This, indeed, was the case for this reader (see below).

Naturally, when the book arrived, I began perusing the pages for names of people I've met. I found Drs. George Folkerts, Karen Lips, and George Rabb. George Folkerts has a salamander named for him, the dwarf black-bellied salamander (*Desmognathus folkertsi*). It is fitting, I think, that a southeastern United States salamander be named for Dr. Folkerts as he taught at Auburn University, Alabama, for 38 years. George was a remarkably knowledgeable naturalist, trained not only in zoology, but in botany. In fact, it was his descriptions of southeastern US pitcher plant prairies that first caught my attention (Folkerts, 1982, 1991). I fell in love with pitcher plant prairies when I lived in north Florida, and made many weekend field excursions, camera and tripod in hand, to capture images of the species that comprise this spectacular plant community. I had the good fortune to meet George at a conference in Tallahassee and was in awe of the depth of his knowledge of southeastern plants, animals, and natural communities. We corresponded many years later, after I relocated to southern Illinois, when I was trying to pinpoint his southern Illinois crawfish frog collection localities (he started his academic training at Southern Illinois University at Carbondale [SIUC]). He was anticipating a trip to southern Illinois at the time and we planned to go afield together. To my dismay, he passed away before he could make that trip.

Karen Lips has an anuran named for her, *Incilius karenlipsae* (a toad without a common name). I met Karen, an accomplished herpetologist who investigates amphibian declines in the Neotropics, when she was on the faculty of the Zoology Department at SIUC. I would occasionally stop by her office and chat. Two of these visits stand out in my mind because they resulted in opportunities for me that otherwise would not have materialized. In one case, Karen had been contacted by the Illinois chapter of The Nature Conservancy inquiring about her possible interest in conducting a herpetofaunal survey of one of their recently acquired properties in southern Illinois. The funds they allocated

were not enough to support a graduate student, so she turned them down; but they were sufficient to finance me for several survey seasons. On the second occasion Karen introduced me to her colleague, Dr. Matt Whiles, who was examining gut contents of preserved larval flatwoods salamanders (*Ambystoma cingulatum*) from South Carolina. I had dozens of larval specimens in my basement, which I collected while doing presence/absence surveys for the species in Florida (I collected one specimen per newly discovered breeding site). I received a small stipend to remove stomach contents from my specimens, increasing the sample size of the study nearly four-fold. In their description of *Incilius karenlipsae* (which, sadly, may be extinct) Mendelson and Mulcahy (2010) state that Karen's contributions to the understanding of the cause of amphibian declines in the Neotropics are "extraordinary." I would add "generous" to the list of Karen's attributes; I was sorry to see her leave southern Illinois.

Two amphibians are named for George Rabb, a salamander (*Dendrotriton rabbi*) and a frog (*Ecnomiohyla rabborum*). The frog is actually named for both George and his late wife, Mary. I met George and Mary when I worked as an animal keeper at Brookfield Zoo in the late 1970s and early 1980s. George was the zoo director and Mary managed the zoo bookstore and library. The bookstore, under Mary's direction, carried a number of appealing books, several of which now sit on my bookshelf. Aware of my keen interest in ambystomatid salamanders, George kindly included me in a one-season drift fence survey of blue-spotted salamanders (*Ambystoma laterale*) and the hybrid "species," Tremblay's salamander (*Ambystoma tremblayi*), at a pond in Palos Forest Preserve, Cook County, Illinois. Finding dozens of salamanders in our coffee-can traps was a dream come true for me. George, now retired, continues his work towards the international conservation of wildlife. Sadly, Rabbs' fringe-limbed treefrog is now thought to be extinct in the wild, a casualty of chytridiomycosis, and the last two captive individuals are aging males (Mendelson, 2011).

One name noticeably missing is Steve Karsen. Steve, a Chicago Herpetological Society member and resident of southern Illinois, discovered the first (and only) plethodontid salamander known to occur in Asia. An astute observer, Steve recognized that he had stumbled onto something unique and made sure to get specimens into the right hands. Not only was the salamander a new species, it warranted placement in its own genus, *Karsenia* (Min et al., 2005). It is unclear to me how Beolens and his coauthors missed this eponym. Was the description too recent to be included? No, that doesn't explain the omission as citations go through 2012. Perhaps the answer is that the salamander was described in the journal *Nature*. *Nature* is not listed in the Bibliography, suggesting the authors did not include it in their search for eponyms. However, *Karsenia* does appear at AmphibiaWeb, the online database used by the authors for the most recent scientific nomenclature. No matter the reason, the omission of *Karsenia* detracts from the book and begs the question: "What other eponyms did the authors miss?"

How can a person increase his or her chance of achieving scientific immortality by having a species named for them? One of the best strategies, based on the preponderance of entries in the eponym dictionary, is to contribute significantly to natural science or to be an esteemed colleague of, or collect for, a taxonomist. Another strategy, based on the number of species that have been named for family members or friends of the describer(s) is to be the grandparent or parent of, be born to, be a sibling of, marry, befriend, or work with a taxonomist. It can also help, in some cases, to be a philanthropist (especially one who supports taxonomic research/field work), US president or vice-president, missionary, explorer, photographer, composer, musician, high school teacher, writer, businessperson, or landowner.

The Eponym Dictionary of Amphibians is full of interesting stories and intriguing characters, far too many to adequately encapsulate in this review. So, if you'd like to know who died in the field in the pursuit of knowledge, learn why a species was named after a guerrilla army or after the fictional hero "Zorro," or if you simply enjoy learning about the people behind the name(s), I encourage you go to your local library or bookstore and enjoy this book yourself. You won't be disappointed.

Acknowledgments

I thank Mike Dloogatch for the opportunity to review this book and Erin Palmer for editorial comments.

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Bull. Chicago Herp. Soc. 48(6):79-82, 2013

Notes on Reproduction in Long-nosed Leopard Lizards, *Gambelia wislizenii* (Squamata: Crotaphytidae), from Southern California

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Abstract

A histological examination of gonadal material from long-nosed leopard lizards, *Gambelia wislizenii*, from southern California was conducted. As in *G. wislizenii* from different areas, reproduction is initiated in spring and terminates in early summer. Mean clutch size for 20 females was 5.5 ± 1.4 SD, range = 2–8. One female from May with corpora lutea indicates egg laying begins in that month. Histological information is presented that multiple clutches are produced by *G. wislizenii* in southern California. The smallest reproductively active male (spermiogenesis) measured 83 mm SVL; the smallest reproductively active female (5 follicles > 5 mm) measured 88 mm SVL. Timing in the events of the *G. wislizenii* reproductive cycle is similar to those of many other North American lizards and allows neonates time to feed and accumulate fat reserves before entering hibernation. The possibility of an earlier start of *G. wislizenii* reproduction in Mexico merits investigation.

The long-nosed leopard lizard, *Gambelia wislizenii* (Baird and Girard, 1852) ranges from southern Idaho and eastern Oregon south to Sonora, Coahuila and Zacatecas, Mexico (McGuire, 1996) where it is confined to arid and semiarid lands (Hollingsworth, 2009). Information on reproduction of *G. wislizenii* is in many sources. The most detailed information sources on *G. wislizenii* reproduction are by Tollestrup (1982) and Parker and Pianka (1976). Anecdotal accounts on *G. wislizenii* reproduction are in: Smith (1946); Johnson et al. (1948); Stebbins (1954, 2003); Gates (1957); Tinkle (1959); Robison and Tanner (1962); McCoy (1967); Montanucci (1967); Turner et al. (1969); Fitch (1970, 1985); Parker (1973); Tanner and Krogh (1974); Essghaier and Johnson (1975); Vitt (1977); Behler and King (1979); Nussbaum et al. (1983); Mitchell (1984); Williamson et al. (1994); Brown et al. (1995); Degenhardt et al. (1996); McGuire (1996); Grismer (2002); St. John (2002); Brennan and Holycross (2005, 2006); Lemm (2006); Hollingsworth (2009); Stebbins and McGinnis (2012).

Due to the difficulty in justifying collections of large monthly samples of lizards, utilization of museum specimens for obtaining reproductive data has become increasingly important. The purpose of this paper is to add information on the reproductive biology of *G. wislizenii* from a histological examination of museum specimens from southern California. Histological information that egg deposition begins in May and females produce multiple clutches in southern California is presented. Comparisons of *G. wislizenii* reproduction from different areas are made.

Methods

A sample of 112 *G. wislizenii* consisting of 51 adult males (mean SVL = 97.9 mm ± 7.1 SD, range = 83–114 mm), 46 females (mean SVL = 110.0 mm ± 10.0 SD, range = 88–136 mm), 6 subadult males (mean SVL = 73.8 mm ± 3.9 SD, range = 68–78 mm) and 9 subadult females (mean SVL = 76.8 mm ± 7.5 SD range = 68–83 mm) was examined from the herpetology collection of the Natural History Museum of Los Angeles County (LACM), Los Angeles, California. Lizards were collected 1941–1977.

The left testis and left ovary were removed from males and females, respectively. Gonads were embedded in paraffin, sections were cut at 5 µm and stained by Harris hematoxylin followed by eosin counterstain (Presnell and Schreibman, 1997). Oviductal eggs or enlarged follicles (> 5 mm length) were counted. No histology was performed on them. Histology slides were deposited in LACM. An unpaired *t*-test was used to compare male and female mean body sizes and the relation between clutch size and female body size (SVL) was examined by linear regression analysis (Instat vers. 3.0b, Graphpad Software, San Diego, CA).

Results

The mean body size of adult females was significantly larger than that of *G. wislizenii* males (unpaired *t*-test, $t = 6.9$, $df = 95$, $P < 0.0001$). Monthly stages in the testicular cycle of *G. wislizenii* are in Table 1. Three stages were observed: (1) Regression, germinal epithelium is reduced to 1–2 cell layers.

Table 1. Monthly stages in the testicular cycle of 51 *Gambelia wislizenii* males from southern California.

Month	N	Regressed	Recrudescence	Spermiogenesis
March	4	0	3	1
April	11	1	2	8
May	22	0	0	22
June	8	1	1	6
July	3	2	1	0
August	3	2	1	0

Table 2. Monthly stages in the ovarian cycle of 46 *Gambelia wislizenii* females from southern California.

Month	N	Quiescent	Early yolk deposition	Follicles > 5 mm	Oviductal eggs	Corpora lutea only
March	1	1	0	0	0	0
April	6	1	2	3	0	0
May	19	2	5	7	4*	1
June	10	5	3	2	0	0
July	6	6	0	0	0	0
August	3	3	0	0	0	0
September	1	1	0	0	0	0

* 1 May female with oviductal eggs was undergoing concurrent yolk deposition for a subsequent clutch.

Spermatogonia and Sertoli cells predominate; (2) Recrudescence, germinal epithelium proliferates in preparation for the next period of sperm formation. Primary and secondary spermatocytes predominate. Spermatids are present in late recrudescence; (3) Spermiogenesis, lumina of the seminiferous tubules are lined by sperm or clusters of metamorphosing spermatids. The period of spermiogenesis encompasses April through June (Table 1). Testicular recrudescence commenced in June. The smallest reproductively active male measured 83 mm SVL (LACM 94791) and was collected in San Bernardino County in May. Males smaller than 83 mm SVL were reproductively inactive.

The monthly stages in the *G. wislizenii* ovarian cycle are summarized in Table 2. The period of female reproductive activity encompassed April through June. Mean clutch size (oviductal eggs or follicles > 4 mm) for 20 females was 5.5 ± 1.4 SD, range = 2–8. Two of this sample included two clutches of five eggs, one clutch from each of two females captured in May, that laid clutches in captivity in June. Body sizes (SVL) were not available for these females. One female from May (LACM 94735) from Riverside County with oviductal eggs was undergoing concurrent yolk deposition indicating *G. wislizenii* may produce multiple clutches in the same reproductive season. One May female (LACM 94758) from San Bernardino County contained corpora lutea indicating egg deposition begins in that month. Linear regression analysis revealed a significant positive relation between female body size (SVL) and clutch size (n = 18). This relation is illustrated by the regression equation: ($Y = -2.59 + 0.074X$, $r = 0.56$, $P = 0.016$). The smallest reproductively active female (5 enlarged follicles > 5 mm) measured 88 mm SVL (LACM 94792) and was collected in May in San Bernardino County. Females smaller than 88 mm SVL were reproductively inactive.

Gambelia wislizenii exhibits a reproductive cycle typical of numerous other North American lizards including representatives of many different families (Anguidae, Crotaphytidae, Eublepharidae, Iguanidae, Phrynosomatidae, Phyllodactylidae, Teiidae, Xantusiidae) in which sperm formation and mating occurs in spring and eggs are deposited or neonates emerge in summer. This strategy results in hatchlings appearing in summer when food resources are plentiful. It also allows hatchlings to accumulate adequate fat reserves to utilize during hibernation.

The congeners *Gambelia copeii* (Goldberg et al., 2010) and *G. silus* (Tollestrup, 1982) exhibit a reproductive cycle with timing much like that of *G. wislizenii*.

The number of clutches produced per reproductive season by *G. wislizenii* merits discussion. Nussbaum et al. (1983) reported females from northern populations deposit one clutch of eggs, whereas females from southern populations deposit multiple clutches. Tollestrup (1982) reported *G. wislizenii* produced one clutch of 5–7 eggs per year, but postulated that multiple clutches could be produced under favorable conditions and, perhaps, were typical in southern deserts. Turner et al. (1969) reported females of *G. wislizenii* from southern Nevada produced two clutches in 1965 and 1966 whereas Stebbins and McGinnis (2012) reported *G. wislizenii* females from California produce more than three clutches per year. Turner et al. (1969) reported that production of multiple clutches by *G. wislizenii* likely depends on spring rainfall and resultant food abundance. The congener *G. silus* (as *G. sila*) from San Luis Obispo County, California may produce as many as four clutches in the same year (Germano and Williams, 1992). My finding of one female from May from Riverside County (LACM 94735) with oviductal eggs while exhibiting concurrent yolk deposition for a subsequent clutch indicates *G. wislizenii* may produce multiple clutches in southern California.

Fitch (1985) reported clutches from northern (north of 37°N) *G. wislizenii* females (n = 16) were smaller (4.94) than 47 clutches from more southern females which averaged 6.05. However, this trend was not apparent in the geographic comparisons of *G. wislizenii* clutch sizes (Table 2) in Parker and Pianka (1976).

The appearance of two gravid *G. wislizenii* females in March from Baja California, Mexico, reported by Fitch (1970) suggests the reproductive cycle begins earlier than occurs at higher latitudes. Subsequent examination of additional G. wislizenii from Mexico are warranted to investigate this possibility.

Acknowledgment

I thank G. Pauly (LACM) for permission to examine *G. wislizenii*.

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Appendix

Gambelia wislizenii from southern California examined from the herpetology collection of the Natural History Museum of Los Angeles County (LACM), Los Angeles, California.

Los Angeles County: LACM15631, 15635, 15637-15639, 15641, 15644-15647, 37788, 109498, 132213-132215, 181868; **Riverside County**: LACM15649, 26808, 52880, 52882, 73676, 94717, 94719-94730, 94732-94738, 94740-94742, 94744-94747, 94749-94753, 94756; **San Bernardino County**: LACM 15655, 15657, 15659, 15661, 52877, 64000, 64002, 70175-70177, 70180-70184, 70187, 70189, 70815, 94707, 94731, 94757, 94758, 94760-94764, 94766-94773, 94776-94779, 94782-94789, 94791, 94792-94794, 115560, 122044, 122427, 125976, 126233, 126234, 137896.

Bull. Chicago Herp. Soc. 48(6):83-84, 2013

In fond remembrance of Ilene Sievert, who died December 16, 2012, this year we will reprint several of the essays that Ilene wrote for these pages between 1988 and 1993 under the rubric "Frog City." This one is from October 1990.

Frog City
by Ilene Sievert

VII. A Green Thought: Part 2

In my old-house cold and dusty basement is a small room near the furnace set up for growing plants under artificial light. Banks of cheap fluorescent shop lights hang on various weights and lengths of chain from hooks screwed into the joists. Along the two long walls three deep and two wide they hang over the discarded desk, surfboard-shaped formica kitchen table, and ruined icebox turned on its side and topped with a superfluous basement door. The plants sit in refrigerator trays, broiler pans, plastic greenhouse trays; whatever was cheap, discarded by others or served in a previous avatar with Shirley MacL____. Some plants, prone to rot, are up on racks of plastic egg crate diffusor. Others prefer to wallow in their own drainage.

I grow small orchids, bromeliads, epiphytic cactus, succulents, begonias—an assortment of nonhardy houseplants. Also summer blooming pot plants winter here, fuchsia, agapanthus, browallia, impatiens. Seeds and cuttings are started and bulbs brought to bud. On the floor, cool in summer and cold in winter, are pots of dormant plants, mostly bulbs, amaryllis, calla; also covered pans of cool starting seeds. There are boxes of pots, milk jugs of aging water, watering cans of various shapes and sizes, several misters, spilled dirt, bags of medium, buckets of gravel and sand; a mixed texture of horticultural disorder.

Water evaporates from pans and plants and all gets generously misted once or more per day with very dilute fertilizer solution. The single window is glass block with a screened vent kept open at least a crack except in bitterest weather. A small fan in the farthest corner pushes the upper air in a gentle column downward. The high humidity caused rampant fungus problems until ventilation was provided.

The light fixtures throw off a lot of heat, but when they snap off at night it gets appreciably cooler. They are controlled by timers set to day-length plus two hours, reset monthly. Many plants require seasonal variation of photoperiod to bloom. Hey what the hell is this? These articles are supposed to be about herps and this is boring plant stuff. Tell it to your Aunt Maude's garden club. Jeez!

I beg your pardon, gentle reader. Forgive me for trying your patience. It's really the Editor's fault, you know. He is totally irresponsible. After you have vented your just irritation take some kindly advice from your Author, who is also a reader just like you. When prose seems vagrant and off the point it sometimes pays to emulate the admirable *Pyxicephalus*. Nestle back quietly into your comfy substrate and be cryptic. It may be that something of interest will pass in front of your eager and capable jaws.

One autumn, the season when tender cells must be protected from coming winter lest root and branch shrivel and die, I faced an annoying and familiar problem. Although the pots were

soaked in water, although a citrus oil "organic" drench had been poured through the soil, yet certainly there remained (a) small ant colonies that adore the bark mix of epiphytic plants, (b) sowbugs and earwigs, lovers of moisture, (c) small moths hidden in pot and foliage, and (d) eggs of tiny black flies, fungus gnats, which will hatch indoors, fly upstairs and immolate themselves in moist food and in beverages, particularly milk where they show to advantage.

As I gazed into my threatening green thicket so pregnant with unwanted life, it seemed a wild jungle, a jungle that was lacking in predators.

The resident basement spiders, ghostly pale or tiny and black, were far from doing an adequate job. Perhaps their numbers suffered from too frequent harvest. Peepers cannot resist the twinkly legs. I suspect the spiders have good harvest of each other. When a few are flipped into a jar and taken upstairs, by the time they reach the consumer there usually remains one spider and one or more silk packages. Male half has holy war against house bugs and smashes or gasses all he sees, so mum on the spider farm, please.

A suitable predator for the plant room would have to go lightly, undestructively, amongst sometimes slender, sometimes thorny plants. It should be small enough to consider gnats a useful food. Its droppings must be tiny and innocuous. The room is not tight and a small and agile animal could reach other parts of the house. The effects of such on animals and people must be considered.

Our toughest tree frog is the Cuban, a big lazy galoot who wouldn't pop an eyeball at a gnat; he's better at june bugs. Furthermore he's been a spare eater since maturity, saving up a big gutful for a rare large and smelly poop. Blackie, our all-American toad, would do his patriotic duty and eat anything that

moved, but as sometimes happens with American armed forces, he is too clumsy and rough for a delicate job of assassination. There is, to my knowledge, no CIA toad. Anyway the bulk of Blackie or the Cuban would cause a horrible smell should he die in an inaccessible place. Spring peepers would eat gnats and have no mobility problems but would probably flee the heat of the ballasts, disperse into the house and dry up.

I was thinking of house geckos running up the walls when I remembered the brown anoles. Following our Disneyworld hajj, while still in Florida, we visited a strip of sandy beach between the ocean and an inland waterway. There was so much salt in the air that glasses fogged up and lips licked salty. The dominant vegetation was a hard leaved shrub of open habit growing under the very full sun in what appeared to be pure sand. The base of the bush was alive with large nasty-looking ants, but the branches were alive with jumping little brown lizards.

If these lizards could live and even jump under these conditions they had a fair chance in captivity, so Carolyn of the Swift Hand captured a couple and they traveled tourist class to Chicago in a yogurt cup in my tote. They lived a couple of years in a plastic cage on sand amidst low sansevieria and haworthia. One escaped into the house and was found and recaptured more than six months later in a pile of neglected papers near the cage. It looked fatter and healthier than the one in the cage. Very impressive.

So, when I was in a local pet store and saw a small brown anole alone in a bare cage, ignoring some gross mealworms half her length, she was taken home. Off she scampered into the plants and the next time I saw her, a moth in her jaws, she was quite green. Doggone, she was a green anole so let's get her some company. Every pet store had "chameleons" of unknown species and secret origin so I chose two which appeared to be male and female green anoles and released them in the room. The male soon became large and bold. He bobs and flashes a pink throat fan at me, then runs over to take small newly shed mealworms or waxworms, dusted with calcium and vitamins, directly from the forceps. The girls are shy and will only take the offering if it's put down nearby, and I must move away and keep still.

Their agility is astonishing; they climb and clamber over leaf, stem, chain, walls, between the bulbs and the fixtures, and what isn't climbed is jumped. One night I found a lizard sleeping on a loosely slung light cord, his toes wrapped firmly about it, tight as a tree frog. I never saw them run upside down on the ceiling but would not rule out the possibility. They're more than capable of leaving the room through the many openings between the beams or under the door. There were two sightings last winter on the furnace pipes. Yet, they always return to the room.

How to check on them? Small green and sinuous creatures are not easily spotted amongst foliage and have many hiding places. It's unusual to detect all three in one visit. They like the warm top of the fixtures and I can step on a low stool, peep over the lights, and see one or more. A pass with the mister will cause anyone in the foliage to move, sometimes to run out to lick the fresh drops. Tiny dry droppings mark favorite perches to check. It is startling to move a plant and have a part of it jump away so I carefully shake and inspect each one taken out of the room. This avoids bringing an anole outdoors or into the living room.

I became impatient for the patter of even smaller feet and figured that another male might stimulate breeding activity. An obvious male was chosen out of a ten-gallon pet store tank where he was living peacefully with many others of both sexes, I swear to God, and after a short quarantine he was released into the room.

The resident male did not ponder, did not soliloquize, did not lose a single second wishing for his too too solid flesh to melt. He instantly spotted the new male though more than six feet away. First he bobbed and flashed as briefly as one can do such things, then jumped recklessly across the room, the new male flying before him. Directly as the new male disappeared, staight-away to a female and they bobbed and danced awhile together, till, turning her back but gazing seductively over her shoulder, she slowly climbed up the light cord. He followed and they vanished over the light fixtures, fade and cut. I didn't see the introduced male for a long time and believed him driven from the room or dead in some hiding place.

When spring next came it was time to inspect dormant bulbs asleep in their pots of dry earth and closed up against the light in cardboard boxes. When I got down on the chilly floor and started grubbing and poking about, moving and opening boxes, out crawled the sorriest sick, cold, and starving anole. He was thin as a rack, his pelvis a washboard. His color was brown and he moved so slowly I caught him in my middle-aged hand. He was put in a warm moist tank and hand fed. It was too late. He never regained the will to live.

The ruling Don Anolis grows larger and more green. How relentlessly he must have persecuted the deceased and kept him from warmth and food. I have seen him courting a lady-love. He ignores my presence, the insensitive brute, but she is fearful and moves off though he chases and nips her neck. Small dried up eggs appear on top of the light fixtures; pieces of cork bark and moister locations are ignored. If eggs have been laid in the earth of the pots they'd be hard to detect in the perlite and beads of Osmocote. Alas, no tiny youngsters have appeared to eat the gnats and whitefly so abundant. Has the sharp-eyed male or mommy dearest devoured them? Is an 8 × 12 room full of hiding places too small for young as it was for a second male? All is not yet green and good in paradise. If this problem is resolved there should be a Part 3.

Bull. Chicago Herp. Soc. 48(6):85-86, 2013

Herpetology 2013

In this column the editorial staff presents short abstracts of herpetological articles we have found of interest. This is not an attempt to summarize all of the research papers being published; it is an attempt to increase the reader's awareness of what herpetologists have been doing and publishing. The editor assumes full responsibility for any errors or misleading statements.

NATURAL-HISTORY STUDIES

L. J. Vitt [2013, Herpetologica 69(2):105-117] notes that natural-history studies represent the observational stage of the scientific method, and the single greatest discovery in biological sciences—evolution by natural selection—was based largely on a vast amount of natural-history information collected by Charles Darwin. He briefly reviews natural-history observations that he has made during his career that led to discoveries in life-history theory, placentation in New World *Mabuya* that rivals that of eutherian mammals, social behavior in the North American clade of five-lined skinks, and the relationship of ecological traits of lizards globally to their evolutionary history (phylogeny). Much credit is given to gifted collaborators who provided the intellectual interplay that led to these discoveries. The author briefly comments on what he considers to be frontiers in herpetology that involve combining phylogenetic hypotheses with natural-history data. And a final comment encourages those among us who are able to spend extended time periods in the field to collect as much natural-history data as possible, because these data describe reality, and, as theories and phylogenies evolve, the kinds of basic data that led to Darwin's theory of evolution by natural selection can be applied again and again.

PATTERNS OF WATER LOSS

W. E. Peterman et al. [2013, Canadian J. Zoology 91(3):135-140] note that water balance is critical to survival, growth, and performance of many terrestrial organisms because it can influence foraging time, limit dispersal, and curtail courtship activities. Water loss can vary in time and space across the landscape, and can also be modulated by behavior. Amphibians are particularly sensitive to water loss because their skin provides little to no resistance to evaporative water loss. This study sought to quantify rates of water loss across a heterogeneous landscape using plaster of Paris models as analogs for the western slimy salamander (*Plethodon albagula*). Models were validated within a controlled laboratory setting prior to field deployment, and were shown to approximate rates and magnitudes of water loss observed in living salamanders. Both adult- and juvenile-sized models were tested in the field, and it was found that juvenile-sized models lost water at a greater rate under all contexts. The rates of water loss measured at night (1.5%/h–4.5%/h) were nearly half of those measured during the day (2%/h–10%/h). Rates of water loss were greatest on ridges with southwestern aspects during the day (5%/h–10%/h) and lowest in ravines with northeast aspects at night (1.50%/h–3.75%/h). The results corroborate field observations of salamander activity patterns and distribution across the landscape, providing a physiological mechanism driving fine-scale habitat use and distribution. Although this study tested plaster models as analogs for salamanders, the approach should be generalizable to other amphibian taxa, providing an efficient means of measuring rates of water loss in the field under biologically meaningful contexts.

HATCHLING POND TURTLE BEHAVIOR

D. K. Rosenberg and R. Swift [2013, American Midland Naturalist 169(1):111-121] note that understanding space-use patterns of freshwater turtle hatchlings is critical to guide conservation efforts, yet little is known because of the difficulties in studying this early life-history stage. The authors investigated post-emergence movements and habitat associations of western pond turtles (*Actinemys marmorata*) at two study sites in western Oregon using micro-transmitters and harmonic radar methods. Hatchlings delayed emergence until spring, with few exceptions. Hatchlings typically remained within 2 m of nests for as long as 59 d after initial emergence. During migration from their nests to aquatic habitat, hatchlings embedded themselves in soil for up to 22 d at stop-over sites. Movements between successive stop-over sites averaged 27 m. Although the number of days turtles remained within 2 m of their nest following emergence varied widely among and within nests, hatchlings entered aquatic habitat relatively synchronously. Hatchlings entered aquatic habitat on average 49 d after initial emergence, and traveled an average of 89 m from their nest site. Hatchlings detected in water were always within 1 m of shore and in areas with dense submerged vegetation and woody debris. Because of delayed emergence and extended post-emergent use of the area adjacent to nests, managers must consider the trade-offs of managing vegetation for nest habitat and the potential harm to hatchlings by vegetation management near nests.

COACHWHIPS VERSUS RACERS

D. A. Steen et al. [2013, Journal of Zoology 289(2):86-93] note that when sympatric species compete, character divergence may help maintain coexistence. Snakes are often found in species-rich assemblages while exploiting similar resources; because snake body size is a relatively plastic trait that determines the range of prey sizes an individual may consume, divergence in body size between sympatric species may arise as a result of interspecific interactions. The North American racer, *Coluber constrictor*, and the larger coachwhip, *Coluber flagellum*, have a close taxonomic relationship and similar foraging strategies. Therefore, the authors hypothesized that *C. constrictor* would be smaller where they co-occur with *C. flagellum*, as compared to where *C. flagellum* is absent, throughout the southeastern extent of their range. To evaluate this hypothesis, the authors obtained data on body size for 2321 adult *C. constrictor* and 526 adult *C. flagellum*, along with habitat data and other potentially important factors influencing body size. *Coluber constrictor* was smaller than elsewhere when in peninsular Florida, in pine forests, on hydric soils and in the presence of the larger and potentially competing *C. flagellum*. Body size of *C. flagellum* did not vary by any measured habitat variables. The trends that were documented are consistent with the hypothesis that *C. constrictor* body size is influenced by several variables, including co-occurrence with *C. flagellum*.

DAY GECKO COLOR CHANGES

R. I. I. Ikeuchi and A. Mori [2013, Current Herpetology 32(1): 26-33] note that rapid body color change of animals in response to environmental stimuli has at least three biological functions: predation avoidance, thermoregulation, and intraspecific communication. The authors tested the hypothesis that *Phelsuma kochi*, a Madagascan giant day gecko that normally has a bright green body color, darkens its color to maximize its level of background matching so as to evade predation. Because recent studies revealed that some lizard species are able to eavesdrop on avian alarm calls and respond with antipredator behavior, they conducted a playback experiment of avian alarm calls to examine whether *P. kochi* recognizes alarm calls and changes color in response to them. They played back alarm calls and songs of a syntopically occurring passerine bird, *Terpsiphone mutata*, and white noise to free-ranging geckos. The geckos changed their body color quicker and darker in response to alarm calls than songs, and tended to keep their dark coloration longer after the playback of alarm calls than that of songs or white noise. This result suggests that *P. kochi* is able to eavesdrop on alarm calls of syntopic birds and respond by darkening its body color to reduce its conspicuousness to predators.

EFFECTS OF DROUGHT ON BLANDING'S TURTLES

W. J. B. Anthonysamy et al. [2013, American Midland Naturalist 169(2):322-335] note that drought is an ecological challenge for turtle species worldwide and can be exacerbated by habitat fragmentation and loss, especially for small populations. The authors studied the activity of 16 Blanding's turtles, *Emydoidea blandingii*, using radio-telemetry from 2005–2006 during consecutive drought and normal hydrological years at a fragmented preserve in northeastern Illinois. The preserve experienced drought conditions during 2005 with precipitation levels 20% below the 60 y average. Fine scale measures of activity (i.e., mean water depth at locations, proportion of unique locations, and proportion of locations in dry habitat) differed between years, whereas broad scale measures of activity (i.e., home range, movement distance) did not. On average only 41.3% of 2005 home ranges overlapped with 2006 home ranges suggesting space use shifted between years. Although most proportional habitat use remained unchanged between years, several individuals increased their use of riverine habitats when other wetland habitat dried. This study underscores the need to examine the risks of severe environmental events on vulnerable populations.

RECONCILIATION ECOLOGY

A. M. Linares and P. C. Eterovick [2013, Herpetologica 69(2): 237-256] conducted a herpetofaunal inventory and distribution study at the Inhotim Institute in Brumadinho Municipality (State of Minas Gerais, Southeastern Brazil). The Inhotim Institute is located in a transition area between the Atlantic Forest and Cerrado biomes, and the study site encompasses natural forest fragments (secondary forest) and landscaped areas with buildings and gardens representing human occupancy. Comparison between these habitats provides a test as to whether human habitats designed to be interwoven with small tracts of wild habitat are sufficient to maintain a broad array of native species, as proposed in the concept known as "reconciliation ecology." Field work was conducted 7 d per month from January 2008 to January 2009, except for December 2008. The authors used pitfall traps with drift fences, visual and auditory surveys, and random records and capture by persons not directly involved in the study in both forest and anthropogenic habitats. Sixty-five species were recorded which included 32 amphibians and 33 reptiles. Three anurans and one lizard were introduced species (probably from the transport of plants from other states for landscaping) and were excluded from the analyses. Herpetofaunal species richness was greater in anthropogenic areas, possibly due to the generalist habits of most species and because such areas have a greater availability of suitable breeding habitats for amphibians. The number of species recorded was high compared to other Brazilian sites, suggesting that the reconciliation ecology approach might be an effective conservation strategy for herpetofauna at the Inhotim Institute.

SNAPPING TURTLE HABITAT DIFFERENCES

T. C. Lescher et al. [2013, American Midland Naturalist 169(1): 86-96] address habitat differences of two sympatric turtle species, alligator snapping turtles (*Macrochelys temminckii*) and eastern snapping turtles (*Chelydra serpentina*) in six watersheds in southeastern Missouri. The study found that alligator snapping turtle presence corresponded with higher abundance of submerged physical structures in the stream, deeper water, relatively higher levels of detritus, and warmer water temperatures. Greater amount of aquatic vegetation was important in characterizing eastern snapping turtle presence in traps. Eastern snapping turtles and alligator snapping turtles did not use the same areas spatially at either a microhabitat or macrohabitat scale, and were only trapped at the same location once in 282 trap locations. Future conservation plans for the alligator snapping turtle and eastern snapping turtle should consider the microhabitat characteristics of sites used by these turtles.

FIRE AND AMPHIBIAN COMMUNITIES

S. M. Allingham and M. Harvey [2013, Current Herpetology 32(1):1-8] note that fire is a frequent feature of African grasslands because agriculture is often used as a management tool in conservation areas. Richness, diversity, and abundance of amphibians were compared in four areas of montane grassland subjected to different fire regimes in Nyika National Park (Malawi, southeastern Africa). The surveys were performed using drift fences and pitfall traps randomly set in four areas (12 sites) subjected to the following fire regimes: (A) no fire for at least 15 years; (B) no fire for at least 10 years; (C) no fire for at least 6 years; and (D) annually burned. Vegetation cover and vegetation height were measured. During a 50-day sampling period 370 amphibians from 17 species and six families were collected. The lowest value of abundance was found in areas C and D. The amphibian species *Hyperolius marmoratus* and *H. nasutus* were most abundant in the control area A. *Arthroleptis xenodactyloides*, *Amietophrynus gutturalis* and *Am. maculatus* were found in all areas. There was a strong correlation between vegetation height and species richness. Vegetation structure, which is affected by fire, appears to be a key factor impacting amphibian assemblages in montane grasslands.

Unofficial Minutes of the CHS Board Meeting, May 17, 2013

The meeting was called to order at 7:48 P.M. at the Schaumburg Public Library. Board members Stephanie Cappiello and Cindy Rampacek were absent.

Officers' Reports

Recording Secretary: The board did not meet in April. Minutes of the March 15 board meeting were read and accepted.

Treasurer: The March and April financial reports were presented, discussed, and accepted.

Membership Secretary: Mike Dloogatch read a list of expiring memberships.

Sergeant-at-arms: There were 42 attendees at the April meeting.

Committee Reports

Shows:
• Notebaert Nature Museum, first full weekend of each month.
• Midwest Museum of Natural History, Sycamore, Illinois, June 22, Rockin' for the Reptiles.
Dick Buchholz and Mike Scott will show animals at the Cosley Zoo.

ReptileFest: Andy Malawy shared the preliminary results of this year's 'Fest. This was one of the top 2 years in both attendance and profit. There was discussion about ways to improve drink sales for next year. Jenny moved, and Aaron seconded, to increase the donations to each of the four groups benefiting from the drink sales to $1000 each. After discussion, the motion passed unanimously. Everyone agreed that Rick Hoppenrath did an incredible job at the photo booth this year, stepping in at the last minute, and making it the best ever at over $2900. Josh Baity moved to give the Hoppenrath family a free membership in appreciation for all of Rick's hard work, and Mary's sacrifice! Jenny seconded, and the motion passed unanimously.

Old Business

Junior Herpers: The Junior Herper table at 'Fest was a success. They had several new families interested in coming to meetings, and are looking for speakers.

Banners: The new banners at 'Fest were great. Ideas for more were discussed.

Zoo trip: The trip to the Indianapolis Zoo went well. We are looking for someone interested in organizing another, possibly in the fall.

New Business

Herps of Illinois: A letter was received from Dr. Steve Barten with concerns regarding the collection and release of specimens for the Herps of Illinois exhibit at ReptileFest. Research has shown problems with the spread of disease when captive specimens are released back into the wild. All agreed that this is an important concern, and that in the future CHS members or local nature centers should be enlisted to maintain the exhibit animals in captivity rather than release them.

Nominating committee: As there will be a number of vacancies to fill for next year, the committee will need to begin early looking for candidates.

Round Table

Mike Dloogatch traveled to Texas this spring. It was a great trip, but few snakes were found.

Josh Baity and his wife are expecting their first baby this year, a girl!

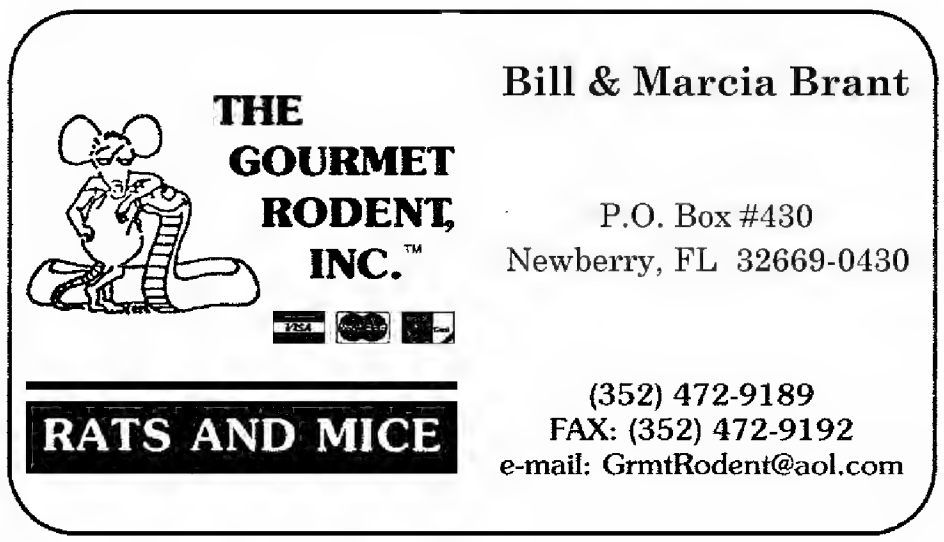
Barbara Nieri has concerns about animal handling at shows, and the videos shot at these events. There was some discussion about ways to address this, but more thought and discussion will be needed.

Nancy Kloskowski thought 'Fest went well. She enjoyed the pizza.

Linda Malawy encouraged everyone to attend the Midwest Herpetological Symposium this year, August 31 – September 3, in Peoria.

The meeting was adjourned at 9:35 P.M.

Respectfully submitted by Jenny Vollman



Advertisements

For sale: rats and mice—pinkies, fuzzies and adults. Quantity discounts. Please send a SASE for pricelist or call Bill Brant, *THE GOURMET RODENT*, PO Box 430, Newberry, FL 32669-0430, 352-472-9189, E-mail: GrmtRodent@aol.com.

For sale: **highest quality frozen rodents**. I have been raising rodents for over 30 years and can supply you with the highest quality mice available in the U.S. These are always exceptionally clean and healthy with no urine odor or mixed in bedding. I feed these to my own reptile collection exclusively and so make sure they are the best available. All rodents are produced from my personal breeding colony and are fed exceptional high protein, low fat rodent diets; no dog food is ever used. Additionally, all mice are flash frozen and are separate in the bag, not frozen together. I also have ultra low shipping prices to most areas of the U.S. and can beat others shipping prices considerably. I specialize in the smaller mice sizes and currently have the following four sizes available: Small pink mice (1 day old—1 gm) , $25 /100; Large pink mice (4 to 5 days old—2 to 3 gm), $27.50 /100; Small fuzzy mice (7 to 8 days old—5 to 6 gm) , $30/100; Large fuzzy mice / hoppers (10 to 12 days old—8 to 10 gm), $35/100 Contact Kelly Haller at 785-234-3358 or by e-mail at kelhal56@hotmail.com

For sale: High quality, all locally captive-hatched tortoises, all bred and hatched here in the upper midwest. Baby leopards, Sri Lankan stars, and pancakes usually available, and are all well-started and feeding great! Leopards are $125 ea., Sri Lankans (2012 hatched) $475 ea. And Pancakes are $195 ea. Leopards for out of state sale/shipping require a veterinary health certificate (inquire for cost). E-mail at KKranz1@wi.rr.com or call Jim or Kirsten at 262 654 6303.

Herp tours: **Costa Rica herping adventures**. Join a small group of fellow herpers for 7 herp-filled days. We find all types of herps, mammals, birds,and insects, but our target is snakes. We average 52 per trip, and this is our 10th year doing it. If you would like to enjoy finding herps in the wild and sleep in a bed at night with air-conditioning, hot water and only unpack your suitcase once, instead of daily, then this is the place to do it. Go to our web-site http://hiss-n-things.com and read the highlights of our trips. Read the statistics of each trip and visit the link showing photos of the 40 different species we have found along the way. E-mail at jim.kavney@gmail.com or call Jim Kavney, 305-664-2881.

Summer Herpetological Field Classes: Research 4 Reptiles, LLC, has openings for ages 12 years to adult for herpetological field classes. Assist in real research studies and learn species identification, capture techniques, and data collection. All classes are limited to 8 individuals and are taught entirely outdoors at pond/prairie sites within Midewin National Tallgrass Prairie in Wilmington, Illinois. Registration details and class information can be found on our website at http://www.research4reptiles.biz. For questions, email Holly Zak at research4reptiles@comcast.net or call 630-337-0757.

Line ads in this publication are run free for CHS members—$2 per line for nonmembers. Any ad may be refused at the discretion of the Editor. Submit ads to mdloogatch@chicagoherp.org.

UPCOMING MEETINGS

The next meeting of the Chicago Herpetological Society will be held at 7:30 P.M., Wednesday, June 26, at the Peggy Notebaert Nature Museum, Cannon Drive and Fullerton Parkway, in Chicago. This will be our popular and always well-attended annual **Show & Tell** meeting. Bring an animal that you find interesting for one reason or another and be prepared to give a short (under five minutes) presentation to the group. Don't be shy. Neither age (yours) nor commonness (the animal's) should be a limitation.

Erica Mede, a certified veterinary technician from Chicago Exotics Animal Hospital, will speak at the July 31 meeting. Erica's topic will be "The Good, the Bad, and the Ugly of Poop." This talk will leave you breathless (not from the odor) and unable to look away from your reptile's feces again. You will learn about the good (beneficial intestinal flora and fauna), the bad (nasties that lurk in your reptile's colon—parasites and pathogens), and the ugly (differences between normal and abnormal feces).

The regular monthly meetings of the Chicago Herpetological Society take place at Chicago's newest museum—the **Peggy Notebaert Nature Museum**. This beautiful building is at Fullerton Parkway and Cannon Drive, directly across Fullerton from the Lincoln Park Zoo. Meetings are held the last Wednesday of each month, from 7:30 P.M. through 9:30 P.M. Parking is free on Cannon Drive. A plethora of CTA buses stop nearby.

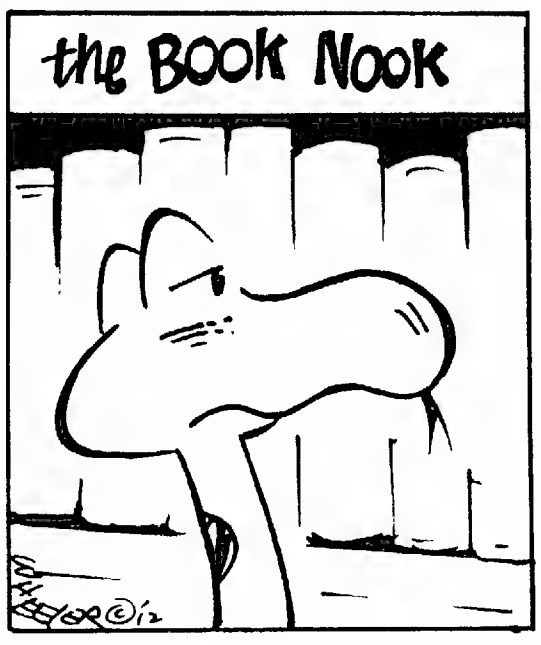
Board of Directors Meeting

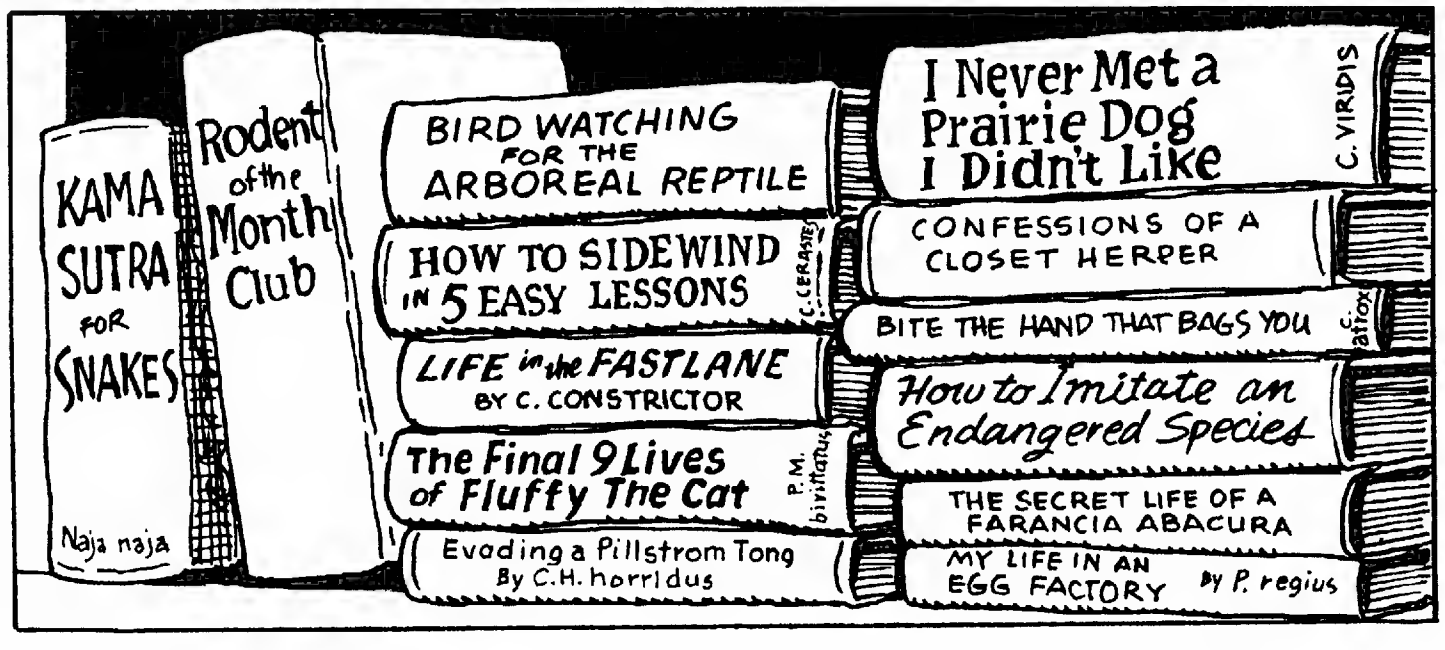
Are you interested in how the decisions are made that determine how the Chicago Herpetological Society runs? And would you like to have input into those decisions? If so, mark your calendar for the next board meeting, to be held at 7:30 P.M., July 19, in the adult meeting room on the second floor of the Schaumburg Township District Library, 130 S. Roselle Road, Schaumburg..

The Chicago Turtle Club

The monthly meetings of the Chicago Turtle Club are informal; questions, children and animals are welcome. Meetings normally take place at the North Park Village Nature Center, 5801 N. Pulaski, in Chicago. Parking is free. For more info visit the group's Facebook page.

THE ADVENTURES OF SPOT

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BULLETIN
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July 2013

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The Reproductive Husbandry of Kenyan Sandboas . . . . . David G. Barker and Tracy M. Barker 89

Notes on the Herpetofauna of Western Mexico 9: Current status of Green Iguanas (*Iguana iguana*) and Western Spiny-tailed Iguanas (*Ctenosaura pectinata*) in the Protected Natural Area "Estero El Salado" in Puerto Vallarta, Jalisco, Mexico . . . . . Ángeles Penilla-Juárez, Daniel Cruz-Sáenz and David Lazcano 92

Frog City: VI. Living in Captivity . . . . . Ilene Sievert 97

Unofficial Minutes of the CHS Board Meeting, June 14, 2013 99

News and Announcements (Midwest Herpetological Symposium) 99

Advertisements 100

Cover: An adult female Kenyan sandboa, *Eryx colubrinus loveridgei*, from the region of Dodoma, Tanzania. Photograph by David G. Barker.

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The Reproductive Husbandry of Kenyan Sandboas

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The Kenyan sandboa, *Eryx colubrinus loveridgei*, is the most common sandboa species in captivity in U.S. collections. It is also referred to as the East African sandboa. The use of "Kenyan sandboa" to identify this taxon dates back to the mid-1970s when the first specimens were imported to this country; Kenya was the country of origin of those first few sandboas. Not long after, the country of Kenya stopped all exports of live boas and pythons.

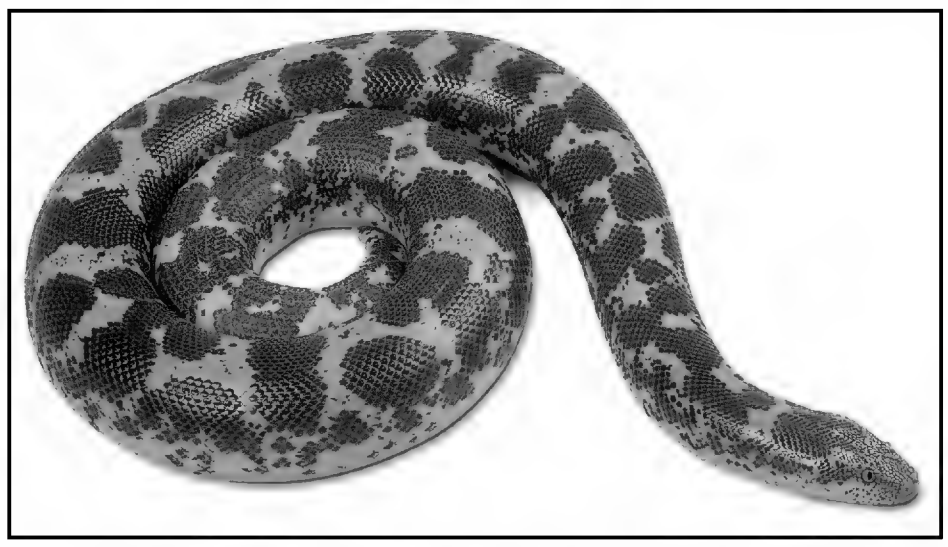
Kenyan sandboas are found from central Ethiopia south to the Dodoma Province of Tanzania, and from southwestern Somalia west across Kenya to the Uganda border. Considering that most U.S. captive specimens are actually descended from Tanzanian stock, the common name "East African sandboa" is probably more appropriate. Nevertheless, "Kenyan sandboa" is the more commonly used name by American keepers.

The first captive breeding of Kenyan sandboas took place in the Houston Zoo in 1979. A paper published in 1982 by John McLain, then the boa and python keeper at the Houston Zoo, described how the female delivered three clutches of babies in two calendar years. At that time, this taxon was very rarely seen in captivity, and the captive-breeding of any boa species was considered noteworthy.

We obtained two baby Kenyan sandboas from one of the early breedings at the Houston Zoo. They were born in 1980. The female died in 2005 at the age of 25 years. The male is still alive in 2013 and is still successfully breeding.

The female bred a total of 19 times in her life, producing more than 300 perfect, well-formed babies without a single deformation or infertile egg mass. She began breeding at four years of age, then delivering a litter of 12; in 1998 she delivered her largest litter of 23. Many of the Kenyan sandboas alive in this country are likely descended from her. She was the largest specimen of Kenyan sandboa that we personally have ever held in hand; she eventually attained a size of 88 cm (34") in total length and weight of 850 g (1 lb, 14 oz).

This subspecies is sexually dimorphic. Our older animals are a good example. In his 20th year, the male was 56 cm (22") in total length and weighed about 175 g (6 oz); that is about the size of a female of 18 months age and much smaller than his very large sister.



An adult Kenyan or East African sandboa, *Eryx colubrinus loveridgei*. Photograph by David G. Barker.

Maintenance

Kenyan sandboas require a secure well-ventilated cage. A glass aquarium with a secure ventilated top (screen wire or perforated metal) can be a satisfactory cage in which to display these beautiful snakes. For years now we have kept our Kenyan sandboas in plastic enclosures in shelf racks. The shelves of the racks are ventilated and provide a ventilated top to each sandboa cage such that humidity doesn't build up in the cage. For many years we kept males in Rubbermaid 16-quart storage boxes with floors measuring 9 × 14", and females in Rubbermaid 32-quart boxes measuring 12 × 18". Today we keep both sexes in boxes with floors measuring 11 × 18". Each cage is supplied with a 16 oz water bowl that is sunken into the substrate.

Over the years we have maintained this species on newspaper, aspen bedding, commercially available brown aquarium gravel, sand, and potting soil. All of these substrates worked adequately, but it has been our experience and observation that this species does extremely well with substrates of aspen bedding or potting soil. In fact they will thrive if kept on paper, but they really do best if allowed to burrow.

These sandboas can be successfully maintained in sand or gravel. However, in nature Kenyan sandboas are associated with loamy soils and are burrow inhabitants. They are not loose sand or sand dune dwellers, as are some of the other species of sandboas. This "sandboa" does not do well in sand.

It is our observation that, given the choice, East African sandboas prefer aspen bedding or potting soil to loose substrates, probably because of a slightly higher level of humidity in those substrates and because these substrates allow the sandboas to construct and use semi-permanent burrows.

When using aspen bedding or potting soil as substrate for adult sandboas, we have had the best results when the substrate is kept 7.5–12.5 cm (3–5") deep in the cage. The animals then create their burrows which we occasionally disturb during cleaning. However, we purposely do not meticulously clean these cages on a daily or weekly schedule. We check the cages daily, paying particular attention to the ambiance and odor of the cage. If it smells fresh and clean, then we don't disturb it. If the odor of some large stool or uneaten meal is detected, then the source of the offending odor is removed. Every second or third month, all the bedding is replaced. It is a very efficient way to maintain the sandboas, who themselves are efficient and clean snakes and allow such a lenient maintenance regime.

These sand boas can live long lives if kept at constant temperatures of in the range of 27–29°C (79–84°F). However, for an optimal breeding environment, we recommend providing a range of temperatures in a sandboa cage; in other words, most of the enclosure at an ambient temperature of 25–26.5°C (77–

A large adult female East African sandboa. This particular animal lived to be 25 years old and had 19 litters of babies. A female about 65% of this length, and half this weight can be an excellent breeder. Photograph by David G. Barker.

79°F). but with an area of heated substrate so that a snake can choose a warmer temperature when preferred.

A warmer basking area can be created in several ways. Sandboas like to bask under warm lights or ceramic bulbs. Likewise, they will sit on a warm area of substrate, heated from below with some type of heating pad. Either way, they usually "bask" in the warmer temperature while in a burrow in the warmed substrate, and not exposed on the surface. We provide a heat-tape that runs under one end of the enclosure, about 2 cm from the side of the cage. The temperature on the floor of the cage, under the substrate and immediately above the heat tape is 34.5°C (94°F).

As is true for many snakes, sandboas can better tolerate temperature extremes if they do not have food in their digestive system. If recently fed, they should not be subjected to temperatures more than 35°C (95°F) or below 23.4°C (74°F). When empty of food, Kenyan sandboas are tolerant of a wider range of temperatures.

Husbandry

We have taken a very simple approach to breeding Kenyan sandboas that has been successful. We use annual light cycles as an important part of the breeding regime, ranging from 15 hours of light at summer solstice to nine hours of light at winter solstice. Both sexes of breeders are fed until mid-December. During the last quarter of the year we feed our females increased amounts of food, resulting in an observable increase in girth and weight by these females. Some males on their own may refuse food late in the year; occasionally males may stop feeding as early as September and not resume feeding until May. But if they'll eat, we feed them until mid-December.

At the end of December we place pairs together, placing the male in the female's cage, and leave them together usually until late April. On the first of January we turn off the supplemental basking heat underneath the cages of the breeders. From the first of January to mid-February the snakes are maintained at 24.5–26.8°C (76–80°F) without any supplemental heat.

In mid-February we resume the slightly warmer normal ambient temperatures and turn on the supplemental basking heat. Several days later we begin feeding the females. We have witnessed copulations from January through early April. Usually by late March the females are staying on the heated basking area for extended periods of time, carefully aligning their distended bellies along the heat tape where it crosses the cage. The males are removed to their cages in April and are then offered food; at that time most males will feed.

The optimal temperature of a basking gravid female that is checked with a non-contact temperature-sensing gun while she is positioned on the heated floor of the cage is 30.6°C (87°F); we regulate the temperature of the heated area of the floor of the cage to achieve this temperature. We regulate cage temperatures to keep the ambient body temperature of a gravid female that is not basking at or about 28°C (83°F).

We have observed that at ovulation the female sandboas show an obvious midbody swelling. This is termed "lumping" by breeders of boas and pythons, referring to a large temporary swelling that occurs from the time when the mature follicles are released by the ovaries until the time when the egg masses, now termed "ova," are moved into the oviducts and spaced along the lengths of the oviducts. The sperm from earlier copulations is present in the oviducts, and fertilization occurs during this time. The period of lumping lasts one to two days, but, as the females usually are in their tunnels in the substrate, out of sight, and we

A newborn East African sandboa, less than a day old. This particular baby is a paradox-albino morph. Paradox-albinos have a pale yellow ground color and rounded gray-brown blotches. They also have inky spots, freckles and small blotches of black melanin randomly placed on the body. Photograph by David G. Barker.

A litter of 18 normal babies, about 12 hours old. Already some of the babies have shed. Photograph by David G. Barker.

have only occasionally happened to observe females sandboas during this brief time. We make every attempt not to disturb ovulating females.

Our females typically feed through most of their gestation. Females typically shed three weeks after ovulation, and deliver their litter about 100 days after this shed. We have had litters born from late July to mid-November. Over the years, our oldest female has delivered most clutches of babies during the first ten days of August, but other females have not been so consistent.

In our experience, clutch size varied from 3 to 23. Even though infertile egg masses (often referred to as "slugs") are a fairly common occurrence in the captive breeding of many live-bearing snakes, we've never seen an infertile egg mass delivered by any species of sandboa; it's possible that this non-observation might indicate that females eat any infertile egg masses they deliver.

At birth, our Kenyan sandboas are 20–23 cm (8–9") in total length and weigh just a fraction of an ounce, only 7.5–9 g. The babies are taken from their mother's cage and set up together in a cage with damp paper towels as substrate. Some babies shed their skins within 24 hours of birth, some just minutes after birth, but other babies may not shed until they are 7-10 days old. Babies are easily sexed, as the tails of males are longer than the tails of females from the time they are born. Babies are easy to sex by "cloacal popping," so any uncertainty can be resolved with confidence.

Caring for the babies

We keep newborns and youngsters in a different setup than older sandboas. While they like to burrow in any substrate, we found that if we created a setup that allowed them to them do so, we then had more difficulties getting them to feed. They end up "hiding" from food that is offered to them and in order to monitor them, we had to dig them up and disturb them.

We house babies individually, separating them several days after birth. The first cage for a baby sandboa is a ventilated plastic box with approximately 250 sq cm (40 sq in) of floor space. In each box is a 6 oz plastic water cup, a sprinkling of aspen covering one half of the cage floor, and one folded paper towel placed on top of the aspen. The aspen is shallow, less than 1 cm (< .4") in depth. In this setup, a youngster sits under the paper towel nestled in the aspen, but he is visible to us when we lift the paper towel without our having to excavate him. We are thus able to monitor him and present food to him without unduly alarming him.

When it comes time to get them to feed, newborn Kenyan sandboas generally present their keepers with few problems. We typically wait 2–3 weeks before we feed them, allowing them to utilize the yolk in their bodies. During that time we handle them minimally. We then offer them live small pink mice for their first few meals, simply placing the prey in the cages and letting the babies follow their instincts. Most often we set the pinks on top of the folded paper towels, and close the boxes and place them back in their places as quietly as possible, knowing that the vibrations of the live pinks moving on the towels are intriguing to the youngsters underneath.

A small percentage of youngsters may not be feeding after several chances. One method that we have employed with some success is to enclose a recalcitrant feeder in an empty (ventilated) plastic butter tub with a tiny live pink mouse. The enforced close proximity to prey often seems to elicit a feeding response from the little snake.

A baby sandboa with a stuck shed can be enclosed in a ventilated plastic butter tub with a piece of wet paper towel. We recommend this rather than soaking in water.

Most adult East African sandboas are very docile and reluctant to bite when they are being handled. Babies are typically snappy, but they are small and the bites are harmless. But when calmly and consistently handled, the youngsters grow to be very docile and trusting adults.

To conclude, the Kenyan sandboa has a well established, viable, self-sustaining captive population, with breeding colonies found across the USA and Europe, and many other localities in the world. No wild-caught animals have been imported to the USA since the mid 1990s, yet the captive population continues to grow. Kenyan sandboas are easy to raise, simple to maintain, and uncomplicated to breed. There are a variety of color and pattern morphs that are commercially available. Kenyan sandboas are beautiful snakes, and in many respects are ideally suited for captivity.

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Notes on the Herpetofauna of Western Mexico 9: Current status of Green Iguanas (*Iguana iguana*) and Western Spiny-tailed Iguanas (*Ctenosaura pectinata*) in the Protected Natural Area "Estero El Salado" in Puerto Vallarta, Jalisco, Mexico

Ángeles Penilla-Juárez [1], Daniel Cruz-Sáenz [2] and David Lazcano [3]

Abstract

To determine the current status of the populations of green iguana (*Iguana iguana*) and western spiny-tailed iguana (*Ctenosaura pectinata*) we conducted surveys each month for a year at three locations in the Protected Natural Area "Estero El Salado." Our objectives included identifying the causes for the decrease in iguana populations and determining abundance for adults, males, females and hatchlings.

Resumen

Con el fin de comprender la situación actual de las poblaciones de iguana verde (*Iguana iguana*) y garrobo de roca, o iguana negra (*Ctenosaura pectinata*) se realizarón muestreos mensuales por periodo de un año en tres localidades dentro del Área Natural Protegida "Estero El Salado." El objetivo de este trabajo es conocer las causas del decremento de las poblaciones de iguana en el Área Natural Protegida. La relación de las abundancias (por sitio y por mes) entre los estadios de adultos, subadultos y crias, asi como proporcion de sexos entre machos y hembras

Introduction

Green iguanas and western spiny-tailed iguanas are economically important species due to exploitation of their eggs and meat. Monitoring their abundance is culturally relevant (Esquivel, 1999; Arcos-Garcia et al., 2002) as the populations of these species have declined over the years. Green iguanas and western spiny-tailed iguanas are threatened by overexploitation and habitat destruction, and these species are protected by the Mexican environmental law (SEMARNAT, 2010) but this listing has little ecological impact.

Recently iguana populations in the Protected Natural Area (*Área Natural Protegida* or APN) "Estero El Salado" have decreased and we have attempted to determine the causes.

Materials and Methods

The APN "Estero El Salado" is located in the municipality of Puerto Vallarta, Jalisco, Mexico. In this area there are four vegetation types: semideciduous forest, mangrove, grassland and aquatic vegetation. Mangrove vegetation is the most abundant and widely distributed vegetation type and includes: red mangrove (*Rhizophora mangle*), white mangrove (*Laguncularia racemosa*) and black mangrove (*Avicennia germinans*). These plant species are protected by Mexican environmental law (FIDES, 2007; SEMARNAT, 2010).

A total of 99 species of birds, 24 amphibians and reptiles, and 17 mammals have been reported for "Estero El Salado."

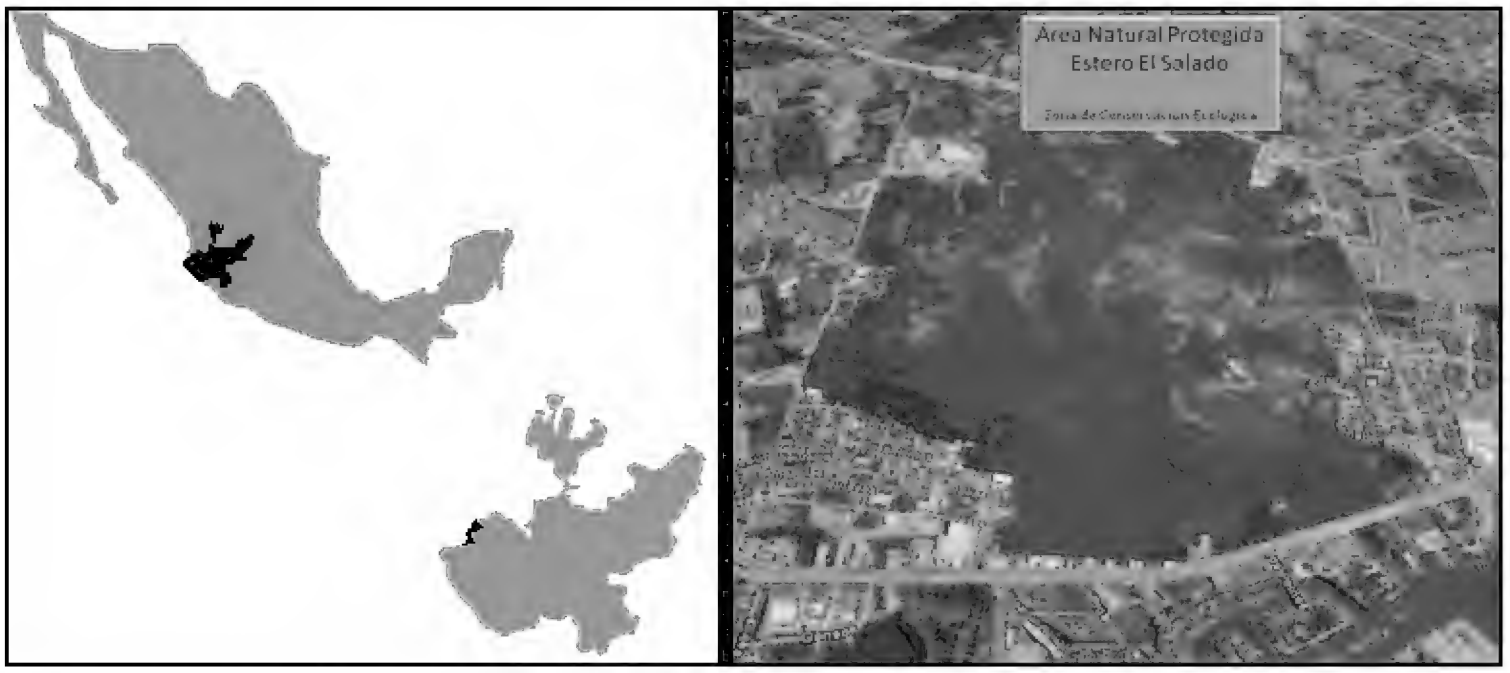

Figure 1. Location of "Estero El Salado."

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Table 1. Sightings of each iguana species by sample site.

Site	*C. pectinata*	*I. iguana*
Las Higueras	16	39
El Vivero	7	11
El Canal	0	67

Sample sites:

Site 1: "Las Higueras" At this site there are groups of fig trees (*Ficus padifolia* and *Ficus citrifolia*), *Bursera arborea* and *Attalea cohune*. The trees grow up to 20 meters above the ground where green iguanas are seen basking. The dominant vegetation type is semideciduous forest and there is less mangrove vegetation in this area.

Site 2: "El Vivero" has thorny vegetation, secondary vegetation, and many introduced species, as it is bordered by part of Puerto Vallarta. This site is located adjacent to the mangrove, thorn forest, and halophytic vegetation types in the area.

Site 3: "El Canal" At this site the dominant vegetation is mangrove. The survey for this site was done in the channel of the estuary by boat. Starting from the channel outwards, the mangroves present are the following species: red mangrove (*Rhizophora mangle*), white mangrove (*Laguncularia racemosa*) and black mangrove (*Avicennia germinans*).

Results

Fieldwork

Twelve surveys conducted between November 2010 and December 2011 resulted in a total of 140 encounters with the two iguana species (Table 2).

Rodda et al. (1998) state that capture-mark-recapture methods using toe-clipping are unsuitable for iguanas due to their arboreal behavior. As a result of the gregarious behavior in both juveniles and adults, some population studies have been performed using sightings only (Lara-López and González-Romero, 2002; Muñoz et al., 2003).

In "Estero El Salado" iguanas perch in the *Ficus* trees at 20 m height and field work was conducted using individual sightings (Lara-López and González-Romero, 2002; Muñoz et al., 2003).

Surveys were performed monthly between November 2010 and December 2011. With the intention of covering all vegetation types in "Estero El Salado" a prior survey was conducted to identify the sampling sites.

In each survey two participants conducted the sampling. In each of the sites a transect of 500 m in length and 20 m in width was used to estimate the abundance of the two iguana species. In these surveys abundance, sex, and class stage of the iguanas were recorded. In addition the size of individuals, femoral pores, and gular fold were recorded. We recorded 117 green iguanas and 23 western spiny-tailed iguanas.

The site "Las Higueras" had the greatest number of individuals of western spiny-tailed iguanas, whereas at "El Canal" the species was not recorded. For green iguanas the site which accounted for most of the records was "El Canal," probably because it is a nursery area for the species.

Abundance

In the APN we recorded more green iguanas than western

Table 2. Numbers of two iguana species sighted during monthly surveys at three "Estero El Salado" sample sites.

	Las Higueras		El Vivero		El Canal		Total sightings	
	C. pectinata	*I. iguana*	*C. pectinata*	*I. iguana*	*C. pectinata*	*I. iguana*	*C. pectinata*	*I. iguana*
January	2	3	0	3	0	0	2	6
February	0	1	2	2	0	2	2	5
March	4	0	0	0	0	5	4	5
April	2	0	0	0	0	0	2	0
May	2	7	1	2	0	10	3	19
June	1	3	1	3	0	16	2	22
July	1	11	0	1	0	8	1	20
August	0	5	0	0	0	4	0	9
September	0	0	0	0	0	4	0	4
October	2	3	0	0	0	7	2	10
November	2	4	1	0	0	8	3	12
December	0	2	2	0	0	3	2	5
Total sightings	16	39	7	11	0	67	23	117

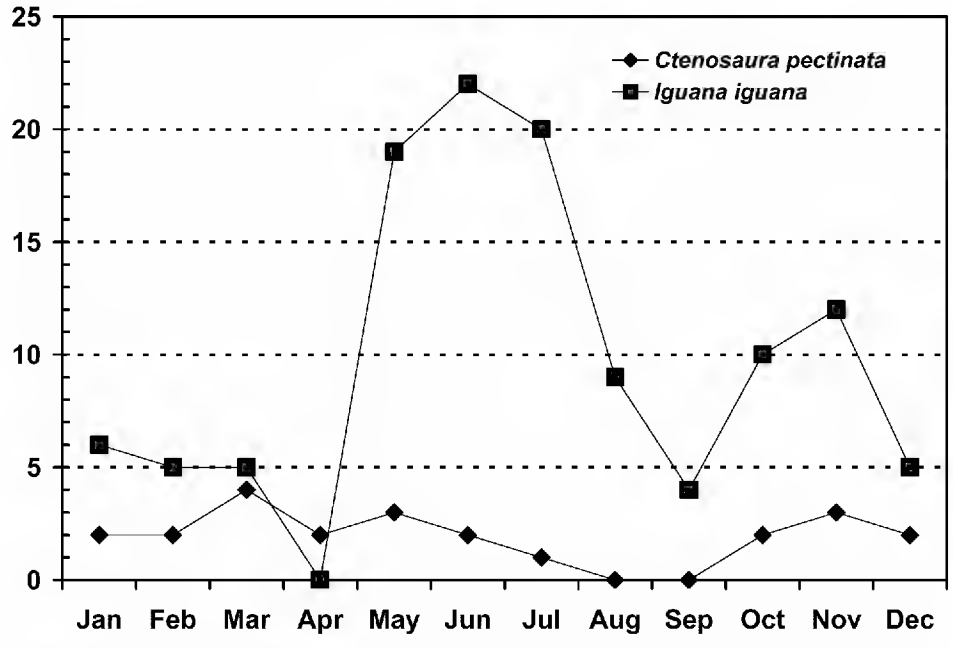

Figure 2. Numbers of iguanas recorded during monthly surveys in the APN "Estero El Salado."

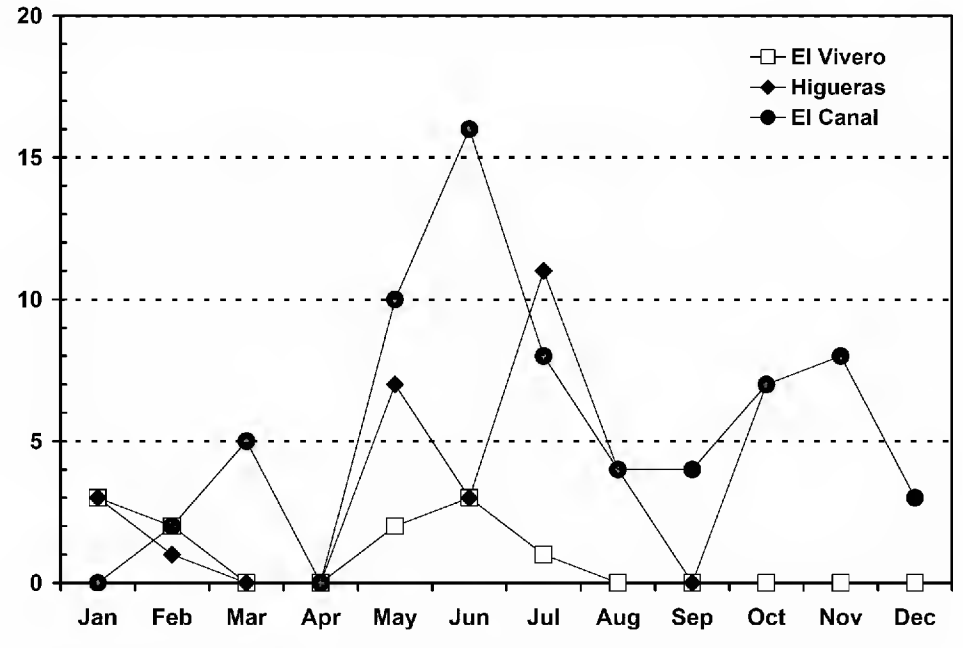

Figure 3. Numbers of green iguanas recorded during each monthly survey at each of the three sample sites.

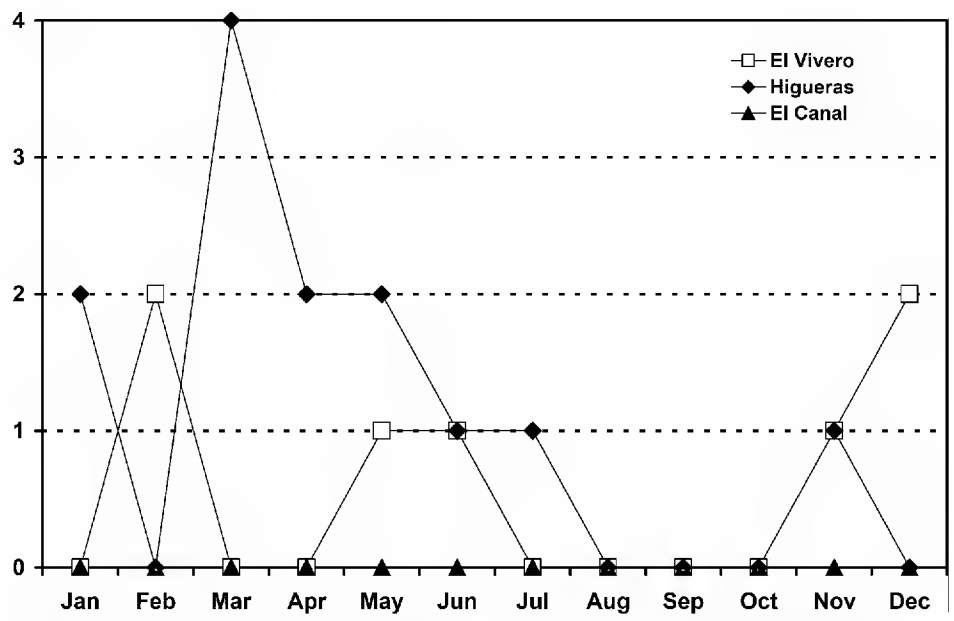

Figure 4. Numbers of western spiny-tailed iguanas recorded during each monthly survey at each of the three sample sites.

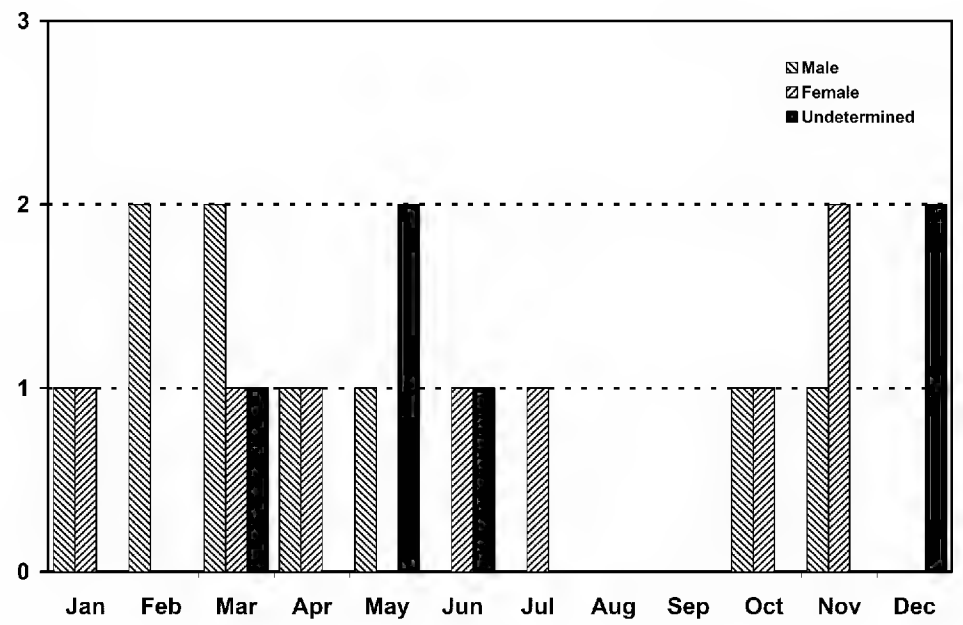

Figure 5. Numbers of western spiny-tailed iguanas recorded during each monthly survey by sex.

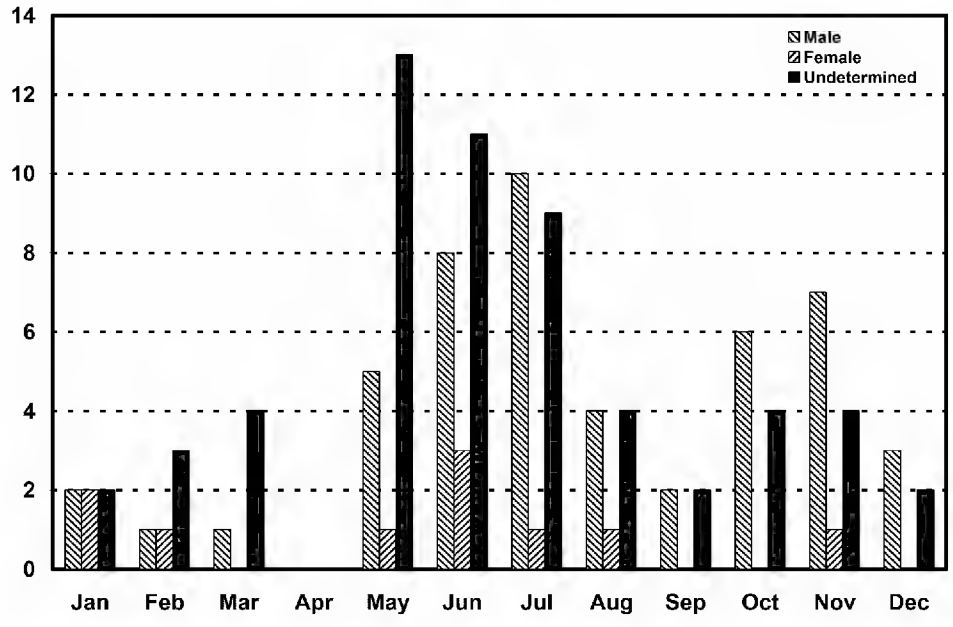

Figure 6. Numbers of green iguanas recorded during each monthly survey by sex.

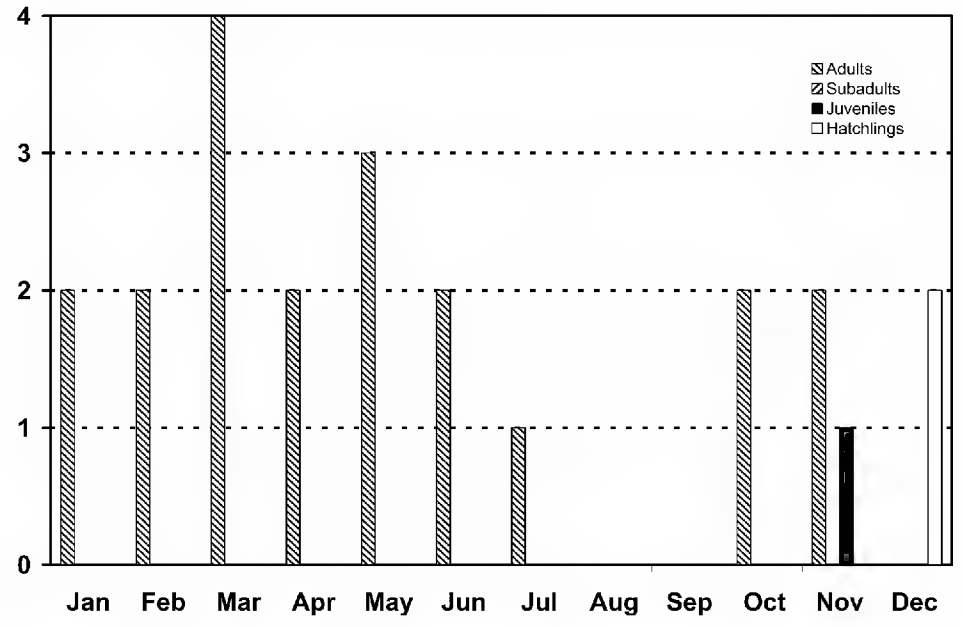

Figure 7. Numbers of western spiny-tailed iguanas recorded during each monthly survey by age class.

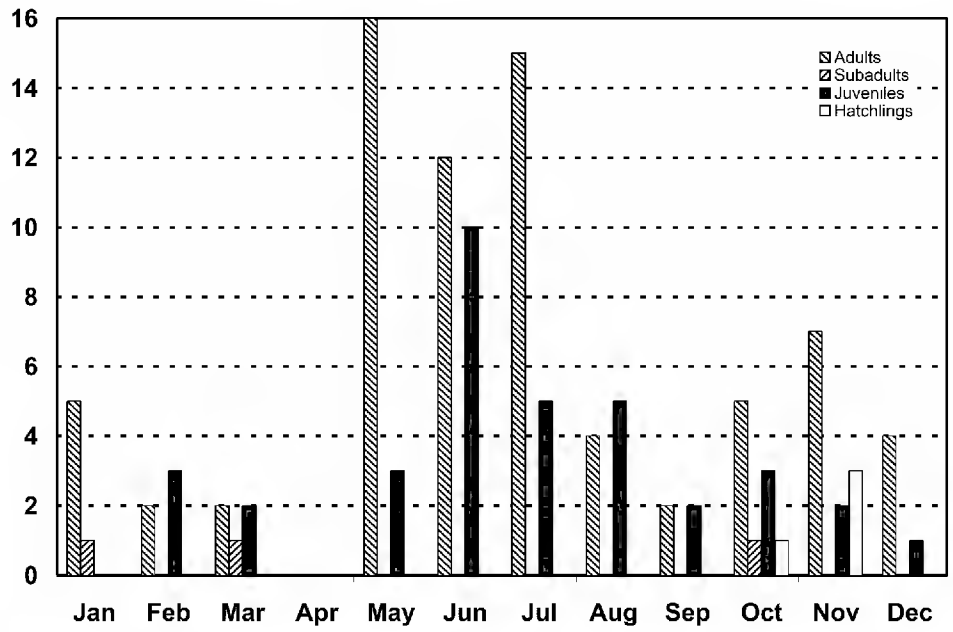

Figure 8. Numbers of green iguanas recorded during each monthly survey by age class.

spiny-tailed iguanas (Figure 2) with 117 total sightings of green iguanas (*Iguana iguana*) and 23 total sightings of western spiny-tailed iguanas (*Ctenosaura pectinata*) across all sites for the year (Table 2).

At the site "El Canal" the month of June had the most green iguanas in the estuary (16 out of a total of 22 green iguanas seen that month) (Figure 3) (Table 2). And in March at the site "Las Higueras" the most western spiny-tailed iguanas were seen (4 iguanas in that month at the site) (Figure 4) (Table 2).

Population structure

We attempted to record the sex of all iguanas seen. This was not always possible due to behaviors such as basking in the tree canopy, in which case sex was recorded as undetermined. For western spiny-tailed iguanas we recorded 9 males, 8 females and 6 undetermined. For green iguanas the numbers were 49 males, 10 females and 58 undetermined. (Table 3; Figures 5 & 6).

In other studies of green iguanas more females than males have been found (Muñoz et al., 2003). In this study we encountered more males than females during the months of February and March for western spiny-tailed iguanas (Figure 5), and in May and June for green iguanas (Figure 6). This can be attributed to reproductive behavior where the males exhibit themselves and can be more easily spotted in the canopy.

We observed more adults than all other life stages combined, due to the physical characteristics that facilitate observation (Table 4).

Early life stages of the two iguana species experience high pressure by predators such as raccoons (*Procyon lotor*), which are common in the area. Elimination of raccoons can benefit a green iguana population (Meshaka et al., 2009), and a similar

Table 3. Number of individuals recorded by sex for each iguana species.

	Ctenosaura pectinata	*Iguana iguana*
Males	9	49
Females	8	10
Undetermined	6	58

Table 4. Number of records per life stage in each iguana species.

	Ctenosaura pectinata	*Iguana iguana*
Adults	20	74
Subadults	0	3
Juvenile	1	36
Hatchlings	2	4

case for ctenosaurs was documented in Florida (Meshaka et al., 2008). In "Estero El Salado" we must also consider the presence of many feral dogs and cats in the area. Another possible native predator is the American crocodile (*Crocodylus acutus*).

For *Ctenosaura pectinata*, two hatchlings were observed in December (Figure 7), which corresponds to the period found by Bock et al. (1998) and Valenzuela-López (1981) indicating that hatching occurs in the rainy season, similar to *Iguana iguana*, in which hatching occurs in October and November (Figure 8).

Juvenile *Iguana iguana* were observed year-round, but in June–August there was a higher number (Figure 8), This could be due to the gregarious behavior of the green iguanas and the absence of parental care in the same species, siblings born in the previous year tend to join groups established nearby.

Conclusions

The dominant iguana species in the "Estero El Salado" is the green iguana (*Iguana iguana*). We observed more males than females. Adults were the life stage we most frequently observed for both green iguanas and western spiny-tailed iguanas.

The sample site where we observed the most green iguanas was "El Canal." The month in which the most green iguana observations occurred was June. The site with the most western spiny-tailed iguanas observed was "Las Higueras." The month with the most observations of western spiny-tailed iguanas was March. There were very low densities of both iguana species in the "Estero El Salado."

The presence of feral mammals (dogs and cats) is a problem for the populations of both green iguanas and western spiny-tailed iguanas. This has been mentioned for other species of

A western spiny-tailed iguana, *Ctenosaura pectinata*, in APN "Estero El Salado." Photograph by Daniel Cruz-Sáenz.

A green iguana, *Iguana iguana*, in APN "Estero El Salado." Photograph by Daniel Cruz-Sáenz.

iguanas by Iverson (1978) and other fauna in Australia by Dickman (1996). Studies on green iguana density in Florida have been documented by Smith et al. (2007).

Despite the ANP being a controlled-access area, cases of illegal poaching of both iguanas in the estuary happen. this has increased over the years, putting more pressure on the populations. This is particularly a problem for green iguanas, which are consumed in the area more than the western spiny-tailed iguanas.

Regardless of natural predators, the ANP "Estero El Salado" has no sandy beach areas, suggesting that the green iguanas are nesting in areas where hard floors are present. This implies that the nests are shallow and are easily preyed upon by raccoons, opossums (*Didelphis virginiana*) and humans. (Morales-Mávil et al., 2007). In population studies of green iguanas in Panama, hatchlings were affected by parasites, the rainfall season, and soil moisture (Bock and Rand, 1989).

Acknowledgments

We thank the "Estero El Salado" Administration and Universidad de Guadalajara for the financial support for this project. And special thanks to the biologists Jaime Torres-Guerrero, Victor-Santos and Alejandra Cueto-Mares for the support in the field surveys, and to biologist Alfredo Frías-Castro for characterizing the vegetation.

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In fond remembrance of Ilene Sievert, who died December 16, 2012, this year we will reprint several of the essays that Ilene wrote for these pages between 1988 and 1993 under the rubric "Frog City." This one is from June 1990.

Frog City

by Ilene Sievert

VI. Living in Captivity

Omne animal est substantia, omnis homo est animal,
ergo, omnis homo est substantia.

All men are mortal.
Socrates is a man.
Therefore, Socrates is mortal.

Even a pampered and well-shielded child will eventually discover that; though a person tries always to be nice, works hard, saves her money; though she eats lots of fruit and avoids fried foods; yet she may be afflicted with pain, crippling, disease, accident, and to top it off, death. Youth and innocence will not save her, nor will dignity, honors, achievements or wisdom of experience. Regrets and repentance avail not. Everyone must take her unequal portion in the fragility of life and suffer the dice-throw of chance. Sometimes this cannot be seen without glasses.

As my childhood progressed so did myopia, and I needed glasses long before getting them. I rooted through books with the tip of my nose as a kiwi probes worms. My last name began with a B and school seating was alphabetical so I generally occupied a front seat near the blackboard and teacher. By means of squinting and careful slow copy I seemed no more stupid and sloppy than the average kid and attracted no unwanted attention to my visual deficiencies. But, in high school there was a flood of additional students and, betrayed by the second letter, u, I was pushed to rear seating by those of alphabetical precedence. There arose a strong need to request a personal variance from custom, a serious matter in traditional culture; a serious matter for me. Although I persuaded the less principled teachers, defeat waits patiently for its victim when one obstacle is sufficient. At last and alas, a grim and iron-willed math teacher held up for the Daughter of Israel the graven stone tablets of the immutable seating plan, and forced my parents to do their unpleasant duty upon the vain and reluctant child.

In the movies of my youth, glasses on a woman denoted an unattractiveness so profound that male characters would treat her as a sort of neuter or even as invisible. Ah, but when she removed those glasses her hair loosened, dress shrunk, bosom swelled, lips reddened, lashes and heels elongated in an amazing metamorphosis. The hero noticed her. I was convinced that uncorrected female vision had a powerful stimulative effect on males and I did not wish to set the seal of doom on future romance. So the dreadful unfeminine glasses were used only for reading the blackboard or sheet music, otherwise hung on a chain around the neck, in the manner of a middle-aged sales clerk or dressmaker. A clear view of detail did not obtrude upon a pleasantly fuzzy view of the world at large.

My viewing bubble shrank to the point of hazard. By the time I left high school and moved to another more perilous neighborhood, glasses were necessary in the streets as well as the cloister. Then everywhere the ugly details of my surroundings were revealed in an awful nakedness more shameful than marriage of a son to his father's wife. Transcending all else was a filth of litter, the lowest levels united in a matrix of cigarette butts, gum wrappers, and broken glass. The trampled and choking grass glittered with it. Grey veils cloaked the glass panes and streaked the Gothic limestone buildings.

Along with the discovery of universal filth, grey suds rinsed out of long beatnik hair and large black flecks in white bathtubs, I also first noticed that most of the older university buildings had names and inscriptions set in brass plates or carved into their entry portals, those arched openings too grand and digni-

fied to be mere doorways. Some carven names were of Founders, those of large accomplishment or purse. Other inscriptions denoted the function of the building, the name of the department or school of study. The complex of Billings Hospital had many such entries and departments. Two of them had titles that are monuments of my memory. One was The Home for Destitute Crippled Children, the other The Home for Incurables. What a world—where fresh sweet children could be not only crippled but also destitute! It occurred to me that all mortals, as Socrates in the syllogism, are incurable. Each creature living is too poor and weak to pay all debts as they come due and so falls fatally in arrears. Remember the lady who spent all of her life sweeping, died and was buried in dirt. Even the blessed dirt will not have its peace, but is endlessly changed and reformed, to flow and to float in a ceaseless cycle till it runs smack into the end of the universe, an event I do not expect to witness, survivalism notwithstanding.

It is so maddening to be vulnerable and short-lived when imagination covers so much more. Further, the human sense of justice is offended by undeserved suffering. "Not fair! Not fair!" An implied promise seems broken. To invest heavily in rebellion and grind up precious time ranting on the cruelty of existence—this offers the dubious comforts enjoyed by Captain Ahab. Hostility can be turned inward. Perhaps, one may think, we deserve anything nasty that comes down the pike; in fact, most of us get off more generously than we deserve. Mark Twain thought there wasn't a man who didn't deserve hanging. It's doubtful the idea solaced his old age. On a different tack, instead of fighting life or ourselves and/or the rest of the universe, we could become passive, fatalistic, dull to frustrations and horrors, indifferent to justice. Are they not One, the Slayer and the Slain? If my little angst seems a bit simplistic and tiresome, consider that if I were Plato all this would be wrong on a much higher level and at greater length.

Small wonder there is no universally accepted answer to the age-old question, "How shall a woman live?" I'm determined to take hammer and tongs to the problem, forgive God and myself and enjoy life without being a comic-cosmic kvetch.

As we seem prevented from reliving our lives, the same lives, that is; from consciously correcting as we redo them, applying what has been learned to repeated youth; yet we can vicariously repeat the very short lives of other creatures whose full span is naturally more brief than human years. Consider looking through the wrong end of the microscope, losing a lot of detail and refinement, simplifying and reducing the model to a manageable size. Its grosser dimensions become more comprehensible. The little lumps and twisty parts disappear from view. Our suitably chosen small animal may undergo conception, birth, maturation, prime with reproduction, deterioration of age, and death. At any stage abnormality or disease can occur. The unborn may be too weak to leave the egg; it may have a fatal or disabling defect of development. Our creature may become infected with fungus, bacteria or virus. When old it may lose reactions and abilities necessary for proper feeding and so starve. Conditions of life will affect it. Neglect, ignorance and accident play their part. There is little in these lives not analogous to our own, save this; in order more completely to observe their life events we hold them in captivity. In some significant way we interfere. If the animals that serve me are to be thus confined away from their usual environments, I try to avoid a feeling of evil-doing by offering a benevolent home. This necessitates foregoing the interesting life scheme: Suffering under Deliberate Cruelty. Achievement of such observations would seriously detract from accruement of joy and feelings of self-worth. I hope Dr. Mengele is not widely admired or emulated.

On the other hand, a life pattern needing no effort, no striving, no movement at all, is not usually kindest. To speak self-ishly, it may be a bore to the observer. Does this species normally run, swim, hop, jump, crawl in the course of daily life? Let it do so. Does it prefer to burrow, dig, hide from light? It will be happiest hidden. We can't guarantee happiness with safety for our salamanders or our sons, but we can offer shade for the former and light to the latter. The interest is in the choice.

Simplify or complicate, you run a risk. Individuals confined together may sharpen skills, may know sexual fulfillment, may get cabin fever, may irritate each other to death. Is this divorce necessary? It may save a life. Still, I don't want to miss the triumphant call of a competitive frog after his heroic exertion, or the soothing calm of conspecifics sharing alarm watch, the kissing of mated geckos, fingernail caresses of turtles. Do you remember the pain, victory and relief of birth's expulsion? Watch the waves of contraction ripple down a snake. For this she endures the risks of mating.

Those we keep with us, they do not know or care for us, do not wish to be touched or manipulated by us, do not resent us for their sufferings or feel gratitude for our gifts to them. Their lives, in the wild or out, are moments of fear and joy, satisfaction and hunger. They are cruelly torn or tear others, and are driven by chemical rhythms they do not question. They are denied, or spared, the need to rationalize, to tell stories about the conduct of their lives, or assess the past and plan the future. Small creatures, thank you, though and because you do not care. For this moment of life alone you are superb. If we are also unknowingly in captivity, I hope we may be as useful, edifying and pleasant, though we must follow our own nature as human beings. Try not to form bruises on the top of your head.

Unofficial Minutes of the CHS Board Meeting, June 14, 2013

The meeting was called to order at 7:52 P.M. at the Schaumburg Public Library. Board members Mike Dloogatch, Nancy Kloskowski, Jason Hood and Jenny Vollman were present.

Officers' Reports

Recording Secretary: The May minutes were read and discussed. A quorum was not present, so they could not be accepted.

Treasurer: The March and April financial reports were presented, discussed, and accepted.

Membership Secretary: Mike Dloogatch read a list of expiring memberships.

Sergeant-at-arms: There were 42 attendees at the April meeting.

Committee Reports

Shows:
- Notebaert Nature Museum, first full weekend of each month.
- Midwest Museum of Natural History, Sycamore, Illinois, June 22, Rockin' for the Reptiles.
- Rockford Botanic Gardens, July 3.

ReptileFest 2014: We have reserved the Physical Education Building at UIC for the weekend of April 12–13, 2014. Cards and flyers are being worked on.

Old Business

Junior Herpers: Speakers have been booked for Junior Herper meetings for the rest of the year.

National Herpetological Society: Jason Hood reported that the group is working on their bylaws.

Zoo trip: The Madison [WI] Area Herpetological Society has organized a behind-the-scenes tour at the National Mississippi River Museum & Aquarium, in Dubuque, Iowa, on July 20. They have invited CHS members to join them there.

Membership brochures/cards: We need to print more meeting invitation business cards.

Round Table

Rich Lamszus appreciated the chance to attend the meeting.

David Hoff's Mexican black kingsnake is doing well.

John Archer has raffle items that need to be stored since his house has been sold.

Jason Hood has eggs and babies coming soon.

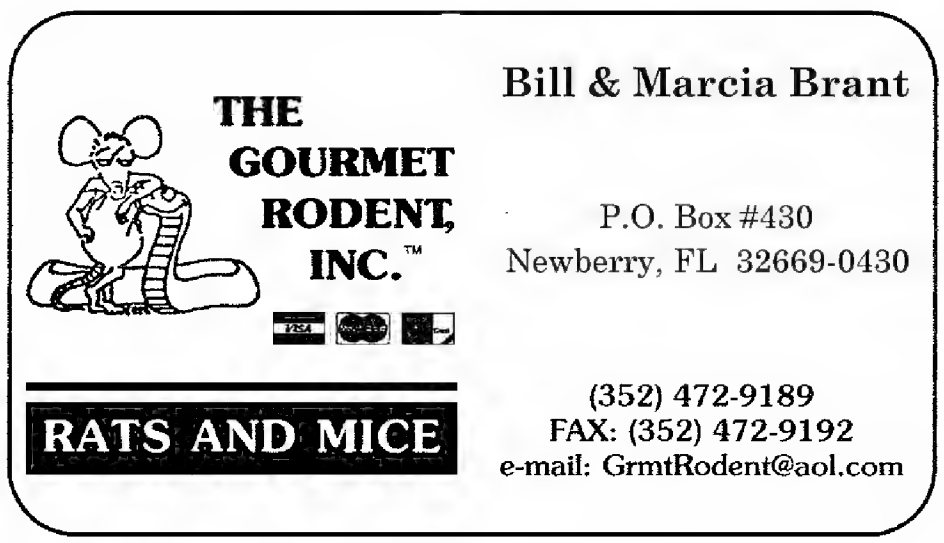
The meeting was adjourned at 8:44 P.M.

Respectfully submitted by Jenny Vollman

News and Announcements

MIDWEST HERPETOLOGICAL SYMPOSIUM

The Central Illinois Herpetological Society will host the 28th annual Midwest Herpetological Symposium August 30–September 1 at the Stony Creek Inn, East Peoria, Illinois. The registration fee is $75 / person. The Saturday night dinner banquet is an additional $20 / person. The event will begin Friday night with socializing, food and drink. Saturday speakers will be: **Dr. Mike Dreslik**, "Massasauga Conservation in Illinois"; **Jessi Krebs**, "Target Training Alligators for Medical Purposes"; **Chawna Schuette**, "Ozark Hellbender Release Work at the St. Louis Zoo"; **Toren Hill**, "The Burmese Pythons of Southern Florida"; **Dr. Travis Wilcoxen**, "Amphibian Development and Disease"; **Bob Bavirsha**, "Catching Crocodilians in Northern Illinois"; **Justin Michels**, "Herping in Southern Illinois." The banquet speaker will be **Dr. Robert Sprackland**, author of *Giant Lizards*. Sunday morning will feature a captive-bred animal sale. Those who are interested can sign up for a camping trip to Snake Road in southern Illinois September 1–2 ($40 fee). Room reservations at the Stoney Creek Inn (800 659-2220) are available at a special symposium rate of $109 / night up until two weeks prior to the event.



Advertisements

For sale: rats and mice—pinkies, fuzzies and adults. Quantity discounts. Please send a SASE for pricelist or call Bill Brant, *THE GOURMET RODENT*, PO Box 430, Newberry, FL 32669-0430, 352-472-9189, E-mail: GrmtRodent@aol.com.

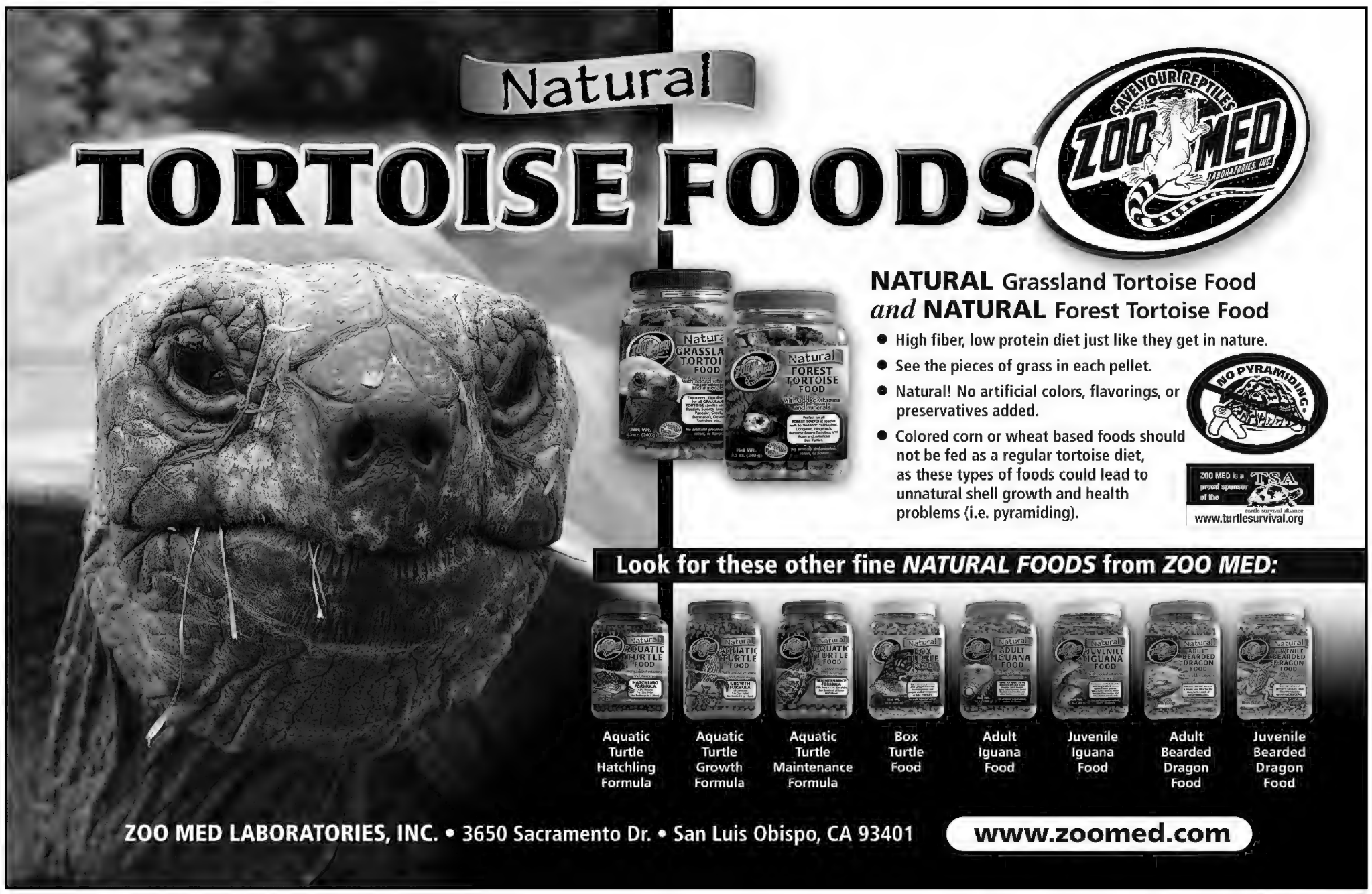
For sale: **highest quality frozen rodents**. I have been raising rodents for over 30 years and can supply you with the highest quality mice available in the U.S. These are always exceptionally clean and healthy with no urine odor or mixed in bedding. I feed these to my own reptile collection exclusively and so make sure they are the best available. All rodents are produced from my personal breeding colony and are fed exceptional high protein, low fat rodent diets; no dog food is ever used. Additionally, all mice are flash frozen and are separate in the bag, not frozen together. I also have ultra low shipping prices to most areas of the U.S. and can beat others shipping prices considerably. I specialize in the smaller mice sizes and currently have the following four sizes available: Small pink mice (1 day old—1 gm) , $25 /100; Large pink mice (4 to 5 days old—2 to 3 gm), $27.50 /100; Small fuzzy mice (7 to 8 days old—5 to 6 gm) , $30/100; Large fuzzy mice / hoppers (10 to 12 days old—8 to 10 gm), $35/100 Contact Kelly Haller at 785-234-3358 or by e-mail at kelhal56@hotmail.com

For sale: High quality, all locally captive-hatched tortoises, all bred and hatched here in the upper midwest. Baby leopards, Sri Lankan stars, and pancakes usually available, and are all well-started and feeding great! Leopards are $125 ea., Sri Lankans (2012 hatched) $475 ea. And Pancakes are $195 ea. Leopards for out of state sale/shipping require a veterinary health certificate (inquire for cost). E-mail at KKranz1@wi.rr.com or call Jim or Kirsten at 262 654 6303.

Herp tours: **Costa Rica herping adventures**. Join a small group of fellow herpers for 7 herp-filled days. We find all types of herps, mammals, birds,and insects, but our target is snakes. We average 52 per trip, and this is our 10th year doing it. If you would like to enjoy finding herps in the wild and sleep in a bed at night with air-conditioning, hot water and only unpack your suitcase once, instead of daily, then this is the place to do it. Go to our web-site http://hiss-n-things.com and read the highlights of our trips. Read the statistics of each trip and visit the link showing photos of the 40 different species we have found along the way. E-mail at jim.kavney@gmail.com or call Jim Kavney, 305-664-2881.

Summer Herpetological Field Classes: Research 4 Reptiles, LLC, has openings for ages 12 years to adult for herpetological field classes. Assist in real research studies and learn species identification, capture techniques, and data collection. All classes are limited to 8 individuals and are taught entirely outdoors at pond/prairie sites within Midewin National Tallgrass Prairie in Wilmington, Illinois. Registration details and class information can be found on our website at http://www.research4reptiles.biz. For questions, email Holly Zak at research4reptiles@comcast.net or call 630-337-0757.

Line ads in this publication are run free for CHS members—$2 per line for nonmembers. Any ad may be refused at the discretion of the Editor. Submit ads to mdloogatch@chicagoherp.org.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UPCOMING MEETINGS

The next meeting of the Chicago Herpetological Society will be held at 7:30 P.M., Wednesday, July 31, at the Peggy Notebaert Nature Museum, Cannon Drive and Fullerton Parkway, in Chicago. **Erica Mede**, a certified veterinary technician from Chicago Exotics Animal Hospital, will speak about "The Good, the Bad, and the Ugly of Poop." This talk will leave you breathless (not from the odor) and unable to look away from your reptile's feces again. You will learn about the good (beneficial intestinal flora and fauna), the bad (nasties that lurk in your reptile's colon—parasites and pathogens), and the ugly (differences between normal and abnormal feces).

At the August 28 meeting **Desiree Wong**, Public Relations Director for the International Reptile Conservation Foundation (IRCF), will speak about the IRCF's work with the Grand Cayman blue iguana and other endangered reptiles.

The regular monthly meetings of the Chicago Herpetological Society take place at Chicago's newest museum—the **Peggy Notebaert Nature Museum**. This beautiful building is at Fullerton Parkway and Cannon Drive, directly across Fullerton from the Lincoln Park Zoo. Meetings are held the last Wednesday of each month, from 7:30 P.M. through 9:30 P.M. Parking is free on Cannon Drive. A plethora of CTA buses stop nearby.

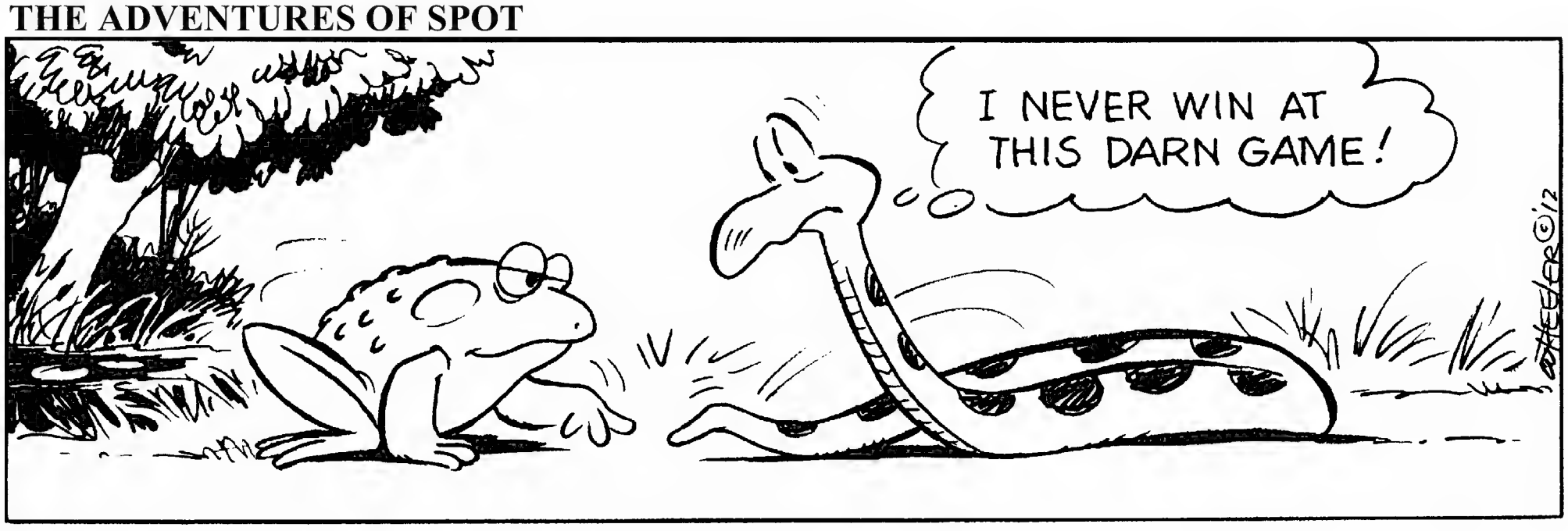
Board of Directors Meeting

Are you interested in how the decisions are made that determine how the Chicago Herpetological Society runs? And would you like to have input into those decisions? If so, mark your calendar for the next board meeting, to be held at 7:30 P.M., August 16, in the adult meeting room on the second floor of the Schaumburg Township District Library, 130 S. Roselle Road, Schaumburg..

The Chicago Turtle Club

The monthly meetings of the Chicago Turtle Club are informal; questions, children and animals are welcome. Meetings normally take place at the North Park Village Nature Center, 5801 N. Pulaski, in Chicago. Parking is free. For more info visit the group's Facebook page.

THE ADVENTURES OF SPOT



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BULLETIN
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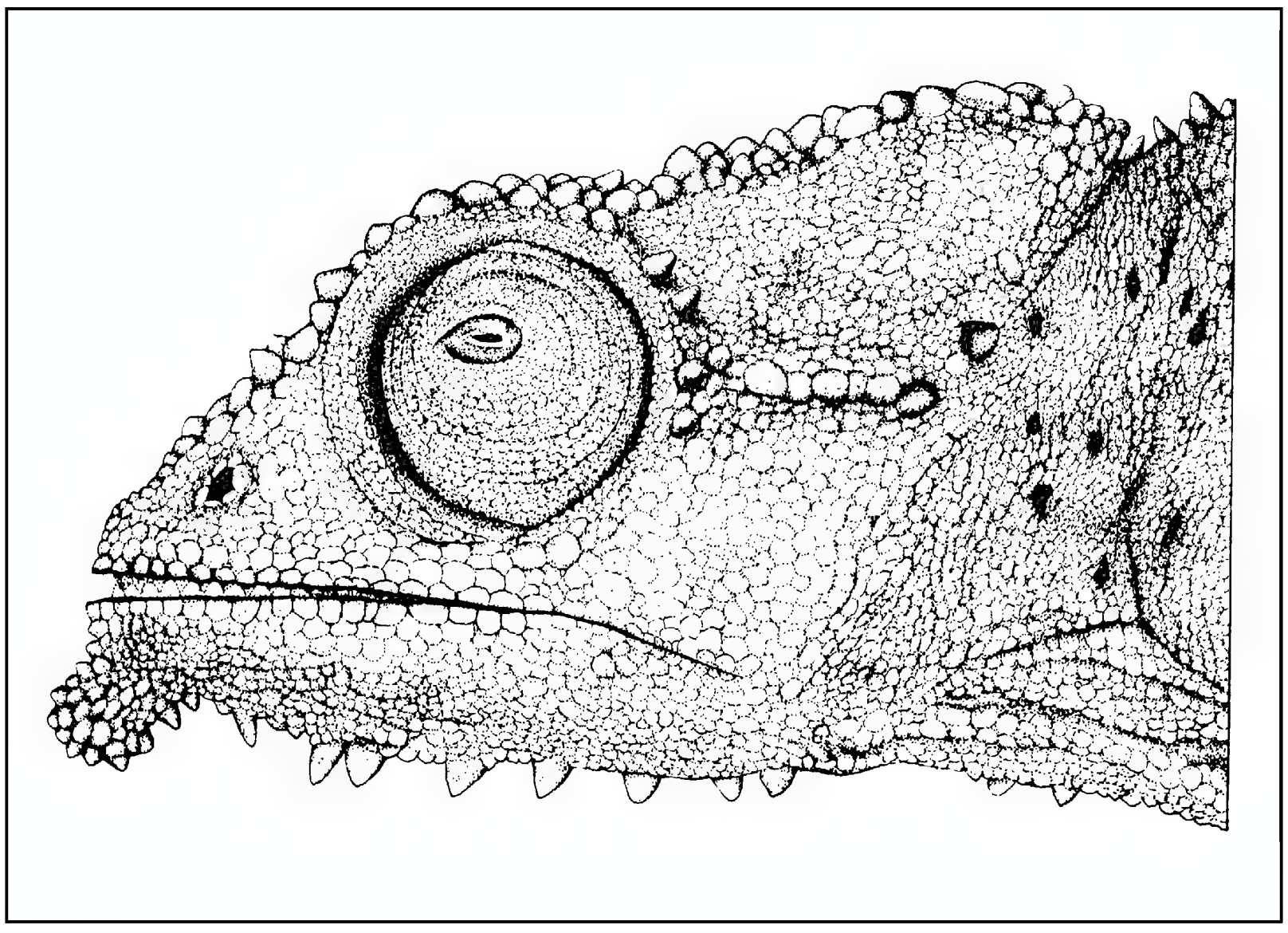

BULLETIN OF THE CHICAGO HERPETOLOGICAL SOCIETY
Volume 48, Number 8
August 2013

A Danger to Snakes in the Garden . . . . . David G. Barker 101

Axial Bifurcation and Duplication in Snakes. Part V. A Review of *Nerodia sipedon* Cases with a New Record from New York State . . . . . Van Wallach and Gerard T. Salmon 102

Notes on Reproduction of Orange-throated Whiptail Lizards, *Aspidoscelis hyperythra* (Squamata: Teiidae), from California . . . . . Stephen R. Goldberg 107

Frog City: VIII. An All-American Toad . . . . . Ilene Sievert 109

What You Missed at the July Meeting . . . . . John Archer 111

The Tympanum . . . . . Lena M. Lindén, Phil Bishop and Onnie Byers 112

Herpetology 2013 113

Unofficial Minutes of the CHS Board Meeting, July 19, 2013 115

Advertisements 116

Cover: Tiger chameleon, *Archaius tigris*, a Seychelles endemic. Drawing (as *Chamaeleo tigris*) from "Faune de Madagascar 47 — Reptiles. Sauriens Chamaeleonidae. Genre *Brookesia* et Complément pour le Genre *Chamaeleo*" by E.-R. Brygoo, 1978.

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The Chicago Herpetological Society is a nonprofit organization incorporated under the laws of the state of Illinois. Its purposes are education, conservation and the advancement of herpetology. Meetings are announced in this publication, and are normally held at 7:30 P.M., the last Wednesday of each month.

Membership in the CHS includes a subscription to the monthly *Bulletin*. Annual dues are: Individual Membership, $25.00; Family Membership, $28.00; Sustaining Membership, $50.00; Contributing Membership, $100.00; Institutional Membership, $38.00. Remittance must be made in U.S. funds. Subscribers outside the U.S. must add $12.00 for postage. Send membership dues or address changes to: Chicago Herpetological Society, Membership Secretary, 2430 N. Cannon Drive, Chicago, IL 60614.

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A Danger to Snakes in the Garden

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On the warm sunny morning of 2 May 2009, the Cibolo Nature Center in Boerne, Texas, received a call from a local woman requesting assistance with a snake problem. She had gone out to water her several raised gardens about 9 o'clock that morning, and to her surprise and dismay, she found a large snake entangled in the mesh netting that surrounded her raised garden plots. She requested that the nature center send out someone to free an "unidentified snake."

The nature center called me. I stopped whatever it was I was doing, gathered such equipment as I thought might be necessary and followed the directions that had been given. About 30 minutes later, I turned in on a long driveway to a home on several acres. When I pulled up to the house, I was met and guided back to the gardens; there entangled in the net was an adult female western coachwhip (*Coluber flagellum testaceus*). She was trussed up from head to tail, but didn't appear to be cut or damaged by the thin nylon line of the netting. She had begun to bite the netting and her mouth was forced open by multiple nylon lines around both jaws. She was one pitiful and miserable snake. The netting wasn't going to kill her outright, but in an hour she would be in full sun. She would not survive that.

Surprisingly, about six feet away was a male coachwhip, identical in size, color and pattern. He had not been there an hour earlier when the female was discovered, but apparently he had just wandered in and was now also trapped by the garden netting. He was not as entangled as the female, but he hadn't been there as long. However, he was caught; he would never have escaped; an hour later he, too, would have been in full sun.

This was my first awareness of the dangers that garden netting poses to snakes. This material, sometimes identified as mesh fencing, is an inexpensive way to protect plants in a flower bed or garden from deer predation. The netting is made of 1" squares of thin black nylon line, and comes in various heights. It doesn't cost much, and it is usually fixed at the top to metal T-posts driven into the ground around the plot. It is popular stuff, inexpensive, and it does keep deer away from the tasty plants.

Netting catches snakes most easily if the bottom of the net is not anchored. However, this is the easiest and most common way to install it. The most commonly sold mesh catches snakes with a body diameter of about an inch or a little bigger. The head of the snake has to be able to fit through the mesh. The snake crawls into it, crawls through an opening in the mesh until the mesh wedges around the body. Then when the snake senses the stricture around its body, it can't back up, and pull itself out of the single hole it has passed through because the material isn't anchored—the net, loose at the bottom, moves with the snake's struggles. The panicked snake then goes through several of the holes in the net, trying to gain purchase so that it can pull loose from the original tangle. Repeat several times, and pretty soon the snake is hopelessly caught.

If the netting is solidly anchored, it is still dangerous to a snake, but when the netting is stretched and anchored around the bottom, a snake can actually pull against the anchored mesh with a greater likelihood to get loose from the original stricture.

I cut those two coachwhips loose from the mess with a pair of fine scissors. It took me about a half-hour to get them free. Interestingly, they did not struggle or attempt to bite me while I worked to cut them loose. Once loose, I carried them about 100 yards away and released them. They never again ended up in the garden net, or so I've been told.

Prior to this experience, I was not familiar with the danger that garden mesh poses to snakes. Since then, I am aware of several Texas ratsnakes, a couple of diamondback watersnakes, and a diamondback rattlesnake that have been caught and killed by the mesh locally. I have also found a large Texas spiny lizard and a mockingbird dead in this kind of mesh. This product is very dangerous to medium-sized snakes. It is like the woven carnival prize called the Chinese finger-trap—you go in but you can't pull out. If used to protect a garden or flower bed, it should be checked several times a day.

Linda Schmeltzer

The arrows point to entrapped female (left) and male (right) coachwhips.

Linda Schmeltzer

Linda Schmeltzer

The male (above) had not been there long and was not too badly tangled. The female (below) was hopelessly snarled.

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Axial Bifurcation and Duplication in Snakes. Part V. A Review of *Nerodia sipedon* Cases with a New Record from New York State

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Introduction

In the most recent review of ophidian axial bifurcation, Wallach (2007) listed 950 total cases from 169 species in 93 genera. Since that time the number of known cases has increased to 850 verified cases (types 1-2) and 500 reliable reports (type 3) for a total of 1350 snakes exhibiting axial bifurcation or duplication (unpubl. data). This figure excludes 35 anecdotal reports (type 4). These records now include 191 species (which is 5% of the 3509 known species) that are allocated to 103 genera (correlating to 19% of the 539 known genera) (Wallach, Williams and Boundy, in press).

It is not surprising that *Nerodia sipedon* is one of the most frequently encountered snakes with axial bifurcation, having first been described by Linnaeus (1758) in his epic and monumental taxonomic treatise. It is not only a widely ranging species of central and eastern North America but also one of the most prolific snakes, giving birth to as many as 99 young per brood, with a mean of 23 neonates (Gibbons and Dorcas, 2004).

Smith and Pérez-Higareda (1987) proposed the following seven terms to categorize axial bifurcation in snakes: craniodichotomy, prodichotomy, proarchodichotomy, urodichotomy, opisthodichotomy, amphidichotomy, and holodichotomy. A craniodichotomous specimen has two incompletely divided heads, a single atlas* and axis*, and a single body and tail. A prodichotomous snake has two complete heads, each with an atlas and axis, either a single or two short necks, and a single body and tail. A proarchodichotomous specimen has two heads, two long necks, and a single body and tail. A urodichotomous snake has one head and body but two tails. An opisthodichotomous specimen has one head, two bodies and two tails. An amphidichotomous snake has two heads, a single body, and two tails. Holodichotomy refers to a pair of twins from a single egg, usually healthy and normal but reduced in size in comparison with their siblings.

Currently 30 documented examples of axial bifurcation in *Nerodia sipedon* are known. The 24 published cases are summarized below in chronological order of their discovery, followed by six unpublished records. A new individual is then described from New York State. Collection acronyms include ANSP (Academy of Natural Sciences of Philadelphia, Philadelphia, PA), CA (Chicago Academy of Sciences, Chicago, IL), GNHL (Grove National Historic Landmark, Glenview, IL), MCZ (Museum of Comparative Zoology, Cambridge, MA), USNM (National Museum of Natural History, Washington, DC), and VWABC (Van Wallach Axial Bifurcation Collection, Cambridge, MA).

Published records

1) The first discovered dicephalic *Nerodia sipedon* came from Shirley, Middlesex County, Massachusetts, and was collected in August 1763 by Captain William Baker. Among the brood of 60 young from a dead gravid female was a 300 mm stillborn specimen with two heads (Anonymous, 1795, 1796). This particular embryo, as a single dicephalic within a litter of 60 normal young, disproved a popular belief that dicephalic snakes represented a separate and valid species (Dareste, 1891) and that a two-headed mother would give birth only to dicephalic young (Anonymous, 1919a).

2) Wyman (1863) reported on and figured an amphidichotomous specimen with two heads and two tails and variously measured between 152 and 178 mm in length collected by Mr. Wells from the Boston vicinity, Suffolk County, Massachusetts. It was deposited in the Massachusetts State Collection under C. L. Flint but later reportedly transferred to the MCZ. However, this snake, refigured by Cunningham (1937: pl. 12, fig. 130), can no longer be found.

3) A dicephalic specimen of *Nerodia sipedon* was described and reported from North America (Anonymous, 1865).

4) The next two specimens were reported from Ohio, the first one, without specific locality data (Anonymous, 1873), was cited by Rothschild et al. (2012).

5) The second case occurred in August 1883 when B. B. Banks collected a 200 mm neonate *N. sipedon* in the reservoir at Antwerp, Paulding County, Ohio, displayed it at the newspaper office in Fort Wayne, Indiana, and proposed selling it to P. T. Barnum the following Saturday (Anonymous, 1883). The St. Louis Museum offered to buy it but its final destination cannot be determined.

6) The next dicephalic *N. sipedon* was an adult prodichotomous specimen, supposedly 1500 mm long, collected by Captain Leo Heit, at the Cut Off three miles below Galena, Jo Daviess County, Illinois, in July 1890, representing the first Illinois record (Anonymous, 1890).

7) A third presumably Massachusetts *Nerodia sipedon* was obtained by N. L. Wilson and described by Johnson (1902: pl. 38, fig. 13) as Case XIII. It is a 177 mm craniodichotomous embryo that was deposited in the University of Wisconsin Anatomical Laboratory.

8) Outram Bangs collected a craniodichotomous specimen in Stoneham, Middlesex County, Massachusetts, making it the fourth specimen from that state (Johnson, 1902).

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* In anatomy, the *atlas* is the first vertebra of the spine, so named because in a human being it supports the globe of the head. The *axis* is the second vertebra. The atlas and axis are specialized to allow a greater range of motion than normal vertebrae.

9) A 203 mm, no locality data, prodichotomous *N. sipedon* in the collection of the Chicago Academy of Sciences (CA 288) was first figured and reported in October 1919 (Anonymous, 1919a) and redescribed by Cunningham (1937: pl. 7, figs. 79-80). Originally identified as *Nerodia fasciata* it was reidentified as *N. sipedon* by Payen (1991).

10) Another record from 1919 and the first from Pennsylvania originated in Waynesboro, Franklin County, Pennsylvania, when a dead gravid female containing 25 embryos was examined on 24 September by S. H. Fitz and found to include a prodichotomous individual (Anonymous, 1919b).

11) Fowler (1922) listed a dicephalic *N. sipedon* from an unspecified locality in Maryland, collected by G. W. Sullivan and deposited in the Philadelphia museum (ANSP 9791) but the specimen was discarded in 1941.

12) A second Pennsylvania record originated from another dead gravid female, examined by I. H. Marshall, from the vicinity of Coraopolis, Allegheny County, Pennsylvania. It contained a craniodichotomous embryo within a brood of 28 *N. sipedon* (Hyde, 1925). A photograph and x-ray of the specimen were provided by Hyde and reproduced by Cunningham (1937: pl. 2, figs. 26-27) and Curran and Kauffeld (1937: fig. 48). The original identification of the snake as a copperhead, *Agkistrodon mokasen*, was in error and corrected by C. H. Pope in Cunningham (1937).

13) A third Ohio specimen, a 178 mm neonate from Big Darby Creek near Columbus, in Franklin County, collected by O. C. Clemmons on 13 September 1925, was subsequently reported and illustrated by Billy Ireland (Anonymous, 1925).

14) Amaral (1927: pl. 3, fig. 4) described and illustrated a 192 mm prodichotomous *N. sipedon* from Johnson County, Kentucky, that is in the National Museum (USNM 38045). Its photograph was reproduced by Cunningham (1937: pl. 8, fig. 93).

15) A 165–173 mm craniodichotomous individual that was born in captivity at the New York Zoological Gardens and donated to T. Barbour at the MCZ on 28 March 1906 (MCZ 7043) was also described and illustrated by Amaral (1927: pl. 3, fig. 5) and Cunningham (1937: pl. 8, fig. 94).

16) A dicephalic *Nerodia sipedon* collected in Quincy, Adams County, Illinois, in August 1935 by Russell Kealen represents the second Illinois record (Anonymous, 1935). The neonate was estimated to be one month old by W. W. Minear, the local high school biology teacher.

17) The second New York record was a craniodichotomous neonate with only three eyes that was found near Lake Sebago, Rockland County, New York in the fall of 1921 by "Van, the Snake Man," and it survived for 28 days (Cunningham, 1937).

18) A dicephalic specimen from Macon, Bibb County, Georgia, the first for that state, was collected by an African-American in 1935 and when the biologist E. E. Byrd attempted to buy it the price was too high so it was lost to the scientific community (Byrd, 1939).

19) The first Canadian record of axial bifurcation in *Nerodia sipedon* comes from a marsh near Rossmore, Ontario. It was collected by Dennis Day and photographed for the newspaper (Anonymous, 1956). The snake died shortly thereafter and was preserved.

20) Paul Krantz collected the third Pennsylvania specimen, a 272 mm craniodichotomous *N. sipedon* from Conestoga Creek near Sunnyside, Lancaster County, Pennsylvania (Ernst, 1960).

21) A highway maintenance crew near Franklin, Heard County, Georgia, dug up a gravid female containing a 250 mm craniodichotomous embryo, the second Georgia record (Anonymous, 1965).

22) The most famous dicephalic *Nerodia sipedon* was collected by Dan and Tad Abston in 1980 in Campbell's Creek near Charleston, Charleston County, West Virginia (Anonymous, 1980). This prodichotomous specimen was purchased by Bill Haast for $50.00 and it lived for at least four years as a star attraction in the Miami Serpentarium in Florida under the name of "Hatfield & McCoy." The left head was dominant but both heads fed. As a neonate it was 150 mm long but it grew to a length of 950 mm after three years (Wood, 1983). Coincidentally, GTS worked at the Miami Serpentarium from 1980 through 1982 and was familiar with this snake.

23) A third Illinois specimen was collected by Stephan Swanson from Gorham, Jackson County, Illinois and the report was illustrated with four figures (Swanson et al., 1997). It is a 218 mm opisthodichotomous *Nerodia sipedon pleuralis* with an apparently single head and body with two tails. However, an x-ray shows two complete vertebral columns independently attached to a partially divided skull (GNHL GR 1995-1).

24) Two Hoover Elementary School boys in Iowa City, Johnson County, Iowa, found a prodichotomous specimen on 5 October 2007 (Williamson, 2007).

Unpublished records

25) In 1917 G. W. Sullivan collected a 148 mm craniodichotomous individual at Preston, Vigo County, Indiana, now deposited in Philadelphia (ANSP 21540).

26) A dried and mounted 190 mm craniodichotomous *N. sipedon pleuralis* that was collected in 1965 in Heard County, Georgia, and survived only one day is on display in Room 431 or 432 of the Georgia State Museum of Science and Industry in the State Capitol building in Atlanta.

27) A craniodichotomous *N. sipedon* from Chester County, South Carolina, was collected by Jim King; it lived only a few days and is now a dried specimen in Exhibit #99 in Ripley's Believe It or Not Museum, Pattaya, Thailand.

28) Cheryl Ankney collected a craniodichotomous *N. sipedon pleuralis* near Olean, Ripley County, Indiana, in August–September 2011. It was donated to Sarabeth Klueh-Mundy of the Indiana Division of Fish and Wildlife.

29-30) One craniodicephalic *Nerodia sipedon* is owned by James and Bonnie Arnold of Texas and another by Terry Lilley of Central Coast Reptile Research Center in San Luis Obispo, San Luis Obispo County, California.

Figure 1. Author (GTS) holding recently captured *Nerodia sipedon* (first photo of Iggy & Ziggy). Photograph by Gerry Salmon.

Figure 2. Close-up showing attachment of heads posteriorly. Photograph by Van Wallach.

Figure 3. Iggy & Ziggy posed next to a penny. Photograph by Van Wallach.

Figure 4. Iggy & Ziggy with a typical prey minnow. Photograph by Van Wallach.

Figure 5. Dorsal view of Iggy & Ziggy after death. Photograph by Van Wallach.

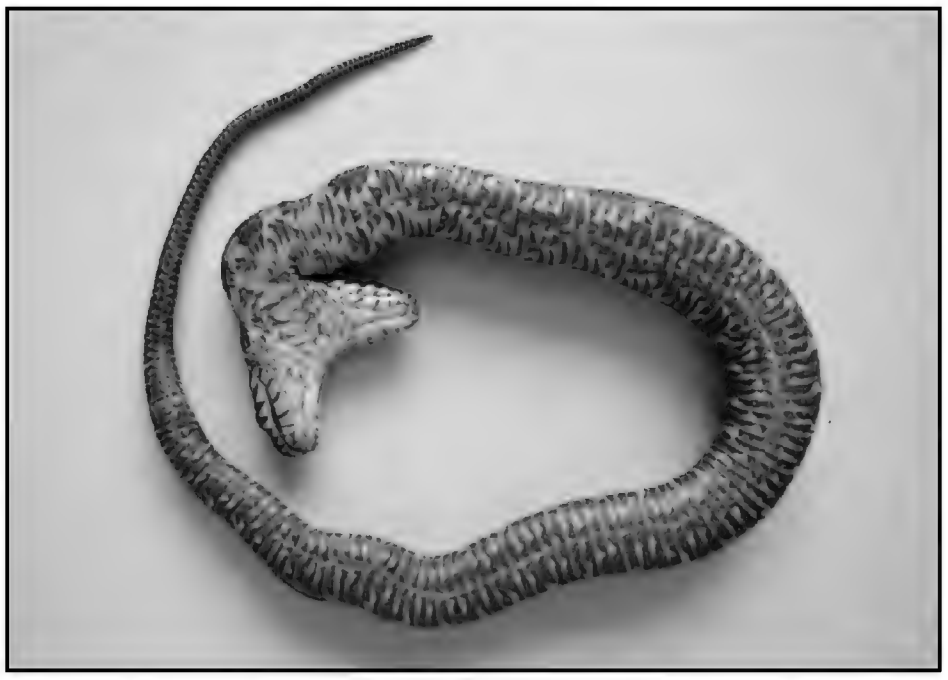

Figure 6. Ventral view of Iggy & Ziggy after death. Photograph by Van Wallach.

New record

On 23 September 2009 GTS received a neonate *Nerodia s. sipedon* that was collected on Honeywell Lane in the town of Hyde Park, Dutchess County, New York (Figure 1). As it was in the process of its first shed, the birth date is estimated to have been between 10–13 September. The snake is craniodichotomous as the heads are not completely separated but joined posterior to the supralabials with the heads at 90° angles to each other (Figure 2). It suffered through some early ordeals as it was initially discovered by Don Burns after he ran over it with a lawnmower (at which time a sibling was killed). Don captured it and, knowing that GTS was an avid snake enthusiast, placed it in the cab of a pickup truck on a hot day while transporting it to GTS. Fortunately, the snake did not succumb to overheating. GTS cared for the snake, helping it with its first ecdysis, and offered various fish and salamanders to it as food items, which it apparently refused.

GTS donated it to VW on 1 October 2009, at which time its length and weight were 185 mm and 4.0 g. The snake was named "Iggy & Ziggy" (Figure 3). It proceeded to eat small minnows on a nearly daily schedule (Figure 4). The snake was never force-fed but once a minnow was placed in its mouth it would swallow the fish it on its own. Both heads could feed but the snake was left head dominant (left head was mainly in line with the body axis) and during its lifetime (between 2 October and 31 December) the left head consumed 70 fish, the right head only one (and once the right head spit out a minnow offered to it). After the first day, when both heads feebly tried to drink water, only the right head was observed to drink. It died on 1 January 2010 of unknown causes (Figures 5 and 6). "Iggy & Ziggy" survived 3.5 months and grew to a length of 217 mm (17% increase in length) and weight of 7.5 gm (88% increase in weight). It never shed its skin a second time, which might be a factor in its mortality. It was preserved after it died for later study of its viscera and osteology (VWABC 15).

Conclusions

This report documents the 31st case of axial bifurcation in *Nerodia sipedon* and the third case from New York State, all of which are craniodichotomous in nature. Among the 31 individuals of *N. sipedon*, the bifurcation type is known in only 21 of them. Statistics reveal that frequencies of the bifurcation types in all snakes (n = 730) are approximately 65% with prodichotomy, 30% with craniodichotomy, 3% with amphidichotomy, 2% with opisthodichotomy, and only 1% with urodichotomy (unpubl. data). However, with the current sample (n = 21) of *Nerodia sipedon*, the frequencies are skewed toward incomplete division of the head with 67% craniodichotomous (n = 14), 24% prodichotomous (n = 5), 5% amphidichotomous (n = 1), and 5% opisthodichotomous (n = 1). Craniodichotomy is present in all three specimens from New York and two each from Georgia, Indiana, Massachusetts, and Pennsylvania. Frequency of occurrence by state is four from Massachusetts, three each from Georgia, Illinois, New York, Ohio and Pennsylvania, two from Indiana, and one each from Iowa, Kentucky, Maryland, South Carolina, West Virginia, Canada and North America, with three of unknown provenance. The total number of voucher specimens of this species currently held in scientific collections is ten.

Acknowledgments

VW wishes to thank everyone who has donated specimens, submitted photographs, and provided literature or reports on dicephalic snakes—past, present and future. Special thanks go to David Barker, who suggested that VW would be interested in the snake for study, and to GTS for donating and delivering the specimen. Any and all information on axial bifurcation in snakes is most welcome, appreciated, recorded and eventually analyzed and studied.

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Notes on Reproduction of Orange-throated Whiptail Lizards, *Aspidoscelis hyperythra* (Squamata: Teiidae), from California

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Abstract

The reproductive cycle of *Aspidoscelis hyperythra* from Riverside County, California, was examined utilizing a histological examination of museum specimens. Reproductive activity commenced in March in males and May in females. Mean clutch size (n = 3) was 2.33 ± 0.58, range = 2–3. The smallest reproductively active male and female measured 50 and 58 mm SVL, respectively. My findings indicate reproduction of *A. hyperythra* in California begins earlier than previously reported. Also, the reproductive cycle of *A. hyperythra* extends later into the summer in Baja California Sur, Mexico, than in southern California.

Aspidoscelis hyperythra ranges from coastal southern California, south to the Cape region of Baja California Sur, Mexico (Stebbins and McGinnis, 2012). There are two detailed reports on its reproductive cycle: (1) from San Diego County, California (Bostic, 1966), and (2) Baja California Sur (Romero-Schmidt and Ortega-Rubio, 2000). Anecdotal information on *A. hyperythra* reproduction is in Smith (1946), Asplund (1967), Stebbins (1954, 2003), Behler and King (1979), Karasov and Anderson (1984), Grismer (2002), Stebbins and McGinnis (2012). The purpose of this note is to provide information on the reproductive cycle of *A. hyperythra* from Riverside County, California. Information is presented that *A. hyperythra* reproduction starts earlier in the year in California than previously published. Comparisons are made between the timing of the reproductive cycle of *A. hyperythra* from California versus Baja California Sur.

Methods

A sample of 45 *A. hyperythra beldingi* was examined, consisting of 27 males (mean SVL = 58.5 mm ± 5.1 SD, range = 50–68 mm), 17 females (mean SVL = 61.5 mm ± 5.1 SD, range = 53–70 mm) and one juvenile female (SVL = 52 mm) collected in Riverside County, California, 1930–1972, and deposited in the herpetology collection of the Natural History Museum of Los Angeles County (LACM), Los Angeles, California (see Appendix).

A small incision was made in the lower part of the abdomen and the left gonad was removed for histological examination. Oviductal eggs were counted, no histology was performed on them. Gonads were embedded in paraffin, sections were cut at 5µm, and stained with Harris hematoxylin followed by eosin counterstain (Presnell and Schreibman, 1997). Histology slides were deposited in LACM. An unpaired t-test was used to test for differences between male and female body sizes (SVL) using Instat 3.0. (Graphpad, San Diego, CA).

Results

There was no significant difference between mean body sizes of male and female samples (unpaired t-test, t = 1.7, df = 42, P = 0.10). The only stage observed in the testicular cycle was spermiogenesis (sperm formation) in which the lumina of the seminiferous tubules were lined by clusters of sperm or metamorphosing spermatids. Spermiogenesis was present in the following monthly male samples: March (N = 1), April (N = 11), May (N = 9), June (N = 4), July (N = 2). Males may commence breeding in March. The smallest reproductively active male (spermiogenesis in progress) measured 50 mm SVL (LACM 99863) and was collected in March.

Monthly stages in the ovarian cycle of *A. hyperythra* from Riverside County, California, are in Table 1. Three stages were present: (1) Quiescent, no yolk deposition; (2) Early yolk deposition, basophilic yolk granules present in ooplasm; (3) Oviductal eggs. One *A. hyperythra* female each from May and June with quiescent ovaries also contained corpora lutea from a recently deposited egg clutch, indicating oviposition occurs during May and June in Riverside County, California. The smallest reproductively active female (LACM 99880) measured 58 mm SVL, contained oviductal eggs and was collected in May. I considered females that measured 53 mm SVL (LACM 53326), 54 mm SVL (LACM 99859) and 55 mm SVL (LACM 99873) as adults in view of Bostic (1966) who reported *A. hyperythra* females from San Diego County were mature at 53 mm SVL. One female collected in April (LACM 150805) with quiescent ovaries measured 52 mm SVL and was considered to be a juvenile. Mean clutch size for my study (n = 3) was 2.33 ± 0.58, range = 2–3. This is identical to the value reported by Bostic (1966) for San Diego County.

Table 1. Monthly stages in the ovarian cycle of 17 *A. hyperythra* from Riverside County, California.

Month	*n*	Quiescent	Early yolk deposition	Oviductal eggs
April	4	4	0	0
May	9	6*	1	2
June	3	2*	0	1
July	1	0	1	0

* one female each from May and June with quiescent ovaries also contained corpora lutea from a recently deposited egg clutch.

Discussion

Female *A. hyperythra* commenced reproductive activity in May (Table 1) as indicated by the presence of oviductal eggs in two females, and corpora lutea but no eggs, indicating a recent oviposition in one female. This differs from Bostic (1966) who reported *A. hyperythra* oviposition commenced in late June. Also, *A. hyperythra* males enter breeding condition (spermiogenesis) in March as opposed to April (Bostic, 1966). It is questionable if the enlarged ovarian follicles (5 mm) from August and September reported by Bostic (1966) would have completed development as his latest report of oviductal eggs was in July. Incidences of follicular atresia (spontaneous degeneration) of vitellogenic follicles increase late in the reproductive season when follicles that failed to complete yolk deposition, degenerate (Goldberg, 1973, 1975). While the number of clutches produced per reproductive season by *A. hyperythra* is not known, Bostic (1966) suggested older lizards could lay two clutches. In view of my finding of a corpus luteum in one May female, indicating a clutch had already been deposited and yolk deposition in one July female for a subsequent clutch (Table 1), it would appear production of two clutches was feasible for some *A. hyperythra* females.

Aspidoscelis hyperythra exhibits a longer period of reproduction in Baja California Sur as the female reproductive season peaked in August when all females contained oviductal eggs (Romero-Schmidt and Ortega-Rubio, 2000). This was supported by Asplund (1967) who found oviductal eggs and enlarged testes in August, Karasov and Anderson (1984) who reported vitellogenesis, oviductal eggs and corpora lutea in August and September and Grismer (2002) who observed *A. hyperythra* hatchlings in late September.

Acknowledgment

I thank G. Pauly (LACM) for permission to examine *A. hyperythra.*

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Appendix

Aspidoscelis hyperythra from Riverside County, California, examined from the herpetology collection of the Natural History Museum of Los Angeles County (LACM).
LACM: 7758-7760, 14749, 53325-53329, 99852-99856, 99859, 99860, 99862-99864, 99866-99870, 99872-99876, 99879, 99880, 115683-115686, 123435-123437, 137860, 137861, 150800, 150802,150804-150806.

Bull. Chicago Herp. Soc. 48(8):109-110, 2013

In fond remembrance of Ilene Sievert, who died December 16, 2012, this year we will reprint several of the essays that Ilene wrote for these pages between 1988 and 1993 under the rubric "Frog City." This one is from January 1991.

Frog City
by Ilene Sievert

VIII. An All-American Toad

Once upon a time the family of my husband's sister lived in a suburb yclept Glendale Heights. Owing and owing to a temporary cash flow problem, their home perforce was modest and in a less prestigious part of town. The little house had been degraded by improvements and thriftily priced. How the previous owners must have loved one-inch ceramic tiles, for they embellished most flat and rectangular surfaces, inside and out, in various colors of the little squares. The protruding masonry of the foundation was painted a crisp white contrast to both brick and black soil. They had painted the exterior trim in the brilliant turquoise usually reserved for public swimming pools and though Donna repainted in brown, peacock drips and slopovers still winked from stone ledges and concrete walks. In an unusual floor plan, a large bathroom, well-tiled, served as a corridor both to basement and living room.

The small yard, furnished out with turfgrass and common shrubs, was somewhat damp because at the rear an abrupt rise to the neighbor's level brought rain in a waterfall rush towards the foundations. Impounded between hill and house, the waters gathered and moisture persisted.

My brother-in-law is not a house-handy man, but he does mow the lawn. I heard him lamenting the task one evening at a family gathering.

"There are so many toads," he complained, "that I cannot avoid mangling some in the mower every time I cut grass."

"Do you really have toads in your yard?" I eagerly asked.

"We have incredible numbers of them. They're in the window wells and last week we found a whole family, dead, in the dryer vent."

I puzzled over this a long moment, then asked, "What do you mean—a whole family?"

"Oh, you know, a mother, a father, and three young ones."

"Just how could you tell which toad was the mother, which the father or children?"

"Well, of course, I went by size; the father largest, and so on."

"Of course," and of course we had a short course of instruction on the life cycle of amphibians and the quality of their nuclear family relationships. He did recall to himself somewhat of frog tadpoles and did toads do that too? Fortunately the man is gracious. Although he suffered a lecture on toad reproduction he did not reciprocate and explain golf to me.

In all of my childhood in the Albany Park–Ravenswood area nary an amphibian had appeared in our yard or environs. This despite proximity to that pristine stream, the North Branch of the Chicago River. Many an hour I gazed into its perfumed waters looking for turtles, frogs, fish; all those creatures that inhabited rivers of my books. The only aquatic life I found was in small overflow pools of a narrow cement-lined channel leading to the North Branch near River Park. All invertebrates, they were netted up into jars and taken home for identification. Anything that made little jumps in the water I called "daphnia." Anything long and wavy was "worm"; big and nasty with legs, "dragonfly larva." I identified mosquito larvae by patient observation of life cycle and gave scientific stimulation to my entire family.

The terrestrial wildlife was unmistakably *Rattus*. They quickly scurried from my footsteps except for one so dead it was alive with maggots. The skin waved and rippled. I knelt down and bent over for a closer look at this highly interesting phenomenon. I had never previously been very close to rat, maggot, or advanced putrefaction. The potency of odor was a nasty surprise and henceforward the phrase "food for worms" had a primarily olfactory memory association. Other children said there were snakes in the long grass but they could never show any to me. I suspected the story was invented to deter or frighten, both fashionable activities for little boys in that sexist era. In my green ignorance I had no idea how secretive and shy snakes are and perhaps they were there.

How I longed to see a non-rat hop, jump, slither, or splash. Youth was spent without ever seeing a live toad; only knowing the mythical animal that was poisonous, gave warts, had a magical jewel in its head, and was an archetype of evil ugliness.

So you may imagine with what delight I heard of the amphib-

ian riches of Glendale Heights. I longed to go on safari to the darkest dampest western suburbs and behold the magnificent untamed wild toads prowling their native habitat: unfettered and free they roam the wet grass, defying dogs, mowers, and brats in search of prey. The toads in search of prey, that is.

We visited again late the following Spring. There were no toads in the grass, even at night. "There's a lot fewer of them this year," said my brother-in-law. "In fact, I haven't seen any."

The summer came and he still hadn't seen any when mowing but his little son had caught a few and released them. Mom preferred no toads indoors and what would you feed them anyway? Bugs in the house! Another brother-in-law with good rural toad hunting experience promised to find one for me. He led me to the dark space behind the garage where some old planks had been long lying on black mud. We lifted a few boards and there he was; big, fat, warty and black as the mud; swollen up with surprise and glaring with helpless hostility. We put him in a big jar with a little water and a ventilated lid, and after all the kids had a chance to say eeyew a toad, he was put in a shady outdoor place. Outdoors for kindness and privacy, yes, but also because he had a peculiar musky odor resembling Spring skunk.

We assumed the blackness was mud which a few soaks would remove along with the wild odor. Although shadowy markings appeared he remained very dark and so he was named "Blackie" after a late lamented dog of the same name. The smell decreased in quantity but the quality remains the same. To perceive it one must bring one's nose closer than Blackie finds socially comfortable.

Blackie is an attractive animal, even amongst toads. His dark polished warts have a lovely semiconical shape, an almost pointed appearance, resembling the business end of an Hawaiian war club. We feel the asymmetry of warts and wart groups is very artistic, providing a sophisticated counterpoint to spherical motifs of body shape. On his turreted eyelids complexity of configurations resembles a Nevelson sculpture, bits of wood painted black. His glaring scowling face is an antique African mask of dark textured hide. Staring stillness enhances a fetish-like appearance, commanding awe by insistent Presence, a sort of Sacred Heart of Darkness. The spell is broken if he hops. This form of locomotion does not seem dignified to humans, though oddly enough, a goosestep does impress some folks.

Blackie ate well and adapted to captivity on newspaper with a big heavy dog dish of water and a broken flower pot for privacy. In this manner he lived for a year. He did not learn to cease starting when there was a sudden movement in the room. He would hop into the wall of his plastic cage and squeak his body trying to climb out, kicking his hide pot around until it was in a useless position. An experience with another toad caused us to rethink Blackie's case. We brought home from a camping trip in West Virginia a large yellow clay-colored male. He climbed incessantly against his cage, ate poorly, and died, presumably of stress. Blackie's behavior was less severe, but one must also consider long term effects. Not only did he push around the shelter so it could not be entered, his wet body moistened the newspaper so it tore and clung in bits to his skin and floated in the water dish. Then his body sat flatly on the smooth airless plastic. I didn't like the look of it. Meditating on the problem, I was inspired by a scrap of Scripture, "Dust thou art and unto dust shalt thou return." A cage was made up with a couple of inches of clean potting soil. The water dish went on one end and a short spreading plant in a plastic pot on the other. He dug himself a sitting pit and though not covered he feels and looks invisible. The plant reminds me to moisten the soil occasionally when I replace his dish of dirty water with a new dish of clean. Now when I change water or add food, instead of jumping away he hunkers down into his pit. His dirty water always has soil from the substrate in it, but we can't tell whether it was clinging to his skin or passed through his digestive tract since he eliminates in the soak. Sometimes there is a dark "toad glove" floating in the dish. If he is disturbed naked in the tub he modestly hops out into his robe of earth. We literally do a cage change. We prepare a clean cage with fresh potting soil, water dish and plant and pop him into it before he's figured it out. The soil goes to the garden, the plant for a bath and vacation, the rinsed dish to the dishwasher, and the cage to be soaked in bleach solution and then plain water.

Blackie has a valuable talent—an accurate and effective strike. It is a pleasure to see him pick off individuals in a disparate-moving crowd of insects. He makes jerky adjustments in position as necessary to emplace his cannon, with eye-popping gulps for recoil. If given insects in a glass bowl he will strike and strike fruitlessly against the glass until prodded or guided into the dish. Evidence of his golden eyes overrides touch of tongue.

Because he is so undiscriminating in his diet, poor Blackie is the garbage can of metamorphosed mealworms. We try to compensate with a dessert of fat nightcrawler. Slime picks up unpalatable lumps of soil so he combs the worms clean with his fingers as they are wrestled down his gullet. This looks like the only exercise he volunteers to do except for climbing in and out of the water dish. Surely he writhes in the shedding dance, but so secretively, it's never been spied out.

Common American toads like Blackie, common as dirt you say, are not easily found now in that western town. The drainage, perhaps, has been improved, the mosquitos abated, the weeds and brush cleared, the bluegrass lawn mowed and treated for pests, the roses sprayed. The children will be as toadless as those of Albany Park in their green and blooming deserts.

Shall we fight this terrible impoverishment, or will these unique creatures find their only significance as storybook puppets or icons of metaphor? Shall she embroider the crane on her wedding kimono and never care if the living bird dances? Shall he carve frogs on his drumstool to charm fecundity yet care not if the ponds teem? Shall the raven dwell only on Odin's shoulders or steal the moon on a totem pole while northern forests are emptied? It is all possible if we do not have toads emerging from under the damp boards, between the shady stones, near the porch light to snap up night bugs with invisible flicks of tongue, swift graceful flicks from a slow fat body. Consider no big round toads puffed out on tip-toe, no tiny toads like black peas with thin legs, no black water commas risking rescue by children from their shallow pools, no sticky strings of twitching dots. Our own springs will dry up. There must be secret creatures hiding in the earth for us, and the king of them all is Toad.

Bull. Chicago Herp. Soc. 48(8):111-112, 2013

What You Missed at the July Meeting

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This month I really wanted to use a word that I'm pretty sure would not get by the editor. A word that probably has no place in a publication such as the *Bulletin*. I have lots of clever thoughts that involve this word but don't quite come across when using its substitutes. Being of limited imagination, I doubt if I could have presented an informative and interesting talk about the subject without using that word, but our July speaker had no trouble at all talking about excrement. Using words such as poop, scat, and feces, Erica Mede managed to provide a humorous but valuable look into the world of animal waste. No small challenge that, but for someone who confesses to spending 60% of her workday looking at excreta, she sailed through the subject manner including pictures that didn't quite reach the totally disgusting level. Who knew that poop could be so fascinating?

Erica Mede. Photograph by Dick Buchholz.

Well, Erica Mede, for one. Here's the summary from the speakers section of the CHS web site:

> The Good, the Bad, and the Ugly of Poop will leave you breathless (and not from the smell) and unable to look away from your reptile's feces again! Here you will learn about the Good (the beneficial flora and fauna of scat), the Bad (the nasties that lurk in your reptile's colon including parasites and signs of disease), and the Ugly (the differences between normal and abnormal dung). The TV show *Scrubs* puts it best, "it all comes down to poop."
>
> Erica is a certified veterinary technician (CVT) from Chicago Exotics Animal Hospital and the president and founder of Friends of Scales Reptile Rescue. Her deep seated love for reptiles started when she was a little girl at the Lincoln Park Zoo, where she spent more time watching garter snakes in the small gardens than looking at the animals on display. Now she works towards her AVTCP Exotic and Avian specialization. Erica is currently the Technician Liaison for the Association of Reptilian and Amphibian Veterinarians (ARAV because that's a mouthful) where she has utilized the rules of Zombieland for her presentation and helps with the CHS Jr. Herper meetings too (not with zombie talk). She currently enjoys sharing her home with a pitbull named Harley Quinn whose greatest joy in life is hiding pig ears under Erica's pillow and her mini-reptile collection all with similarly epic names.

I'm certain that Erica wrote those words. They amply demonstrate her sense of fun and hint at her dedication to reptiles and amphibians. She works at being the best in her field and keeping her sense of humor. A better person could not have been found to deliver her talk.

She opened with a movie poster of *The Good, the Bad, and the Ugly* with an added "by a CVT without a name" and began by defining poop, essentially the undigestibles such as tomato skins, insect parts, human hair, bones, millet, stones and sand. Throw in pigments from broken-down red blood cells, some mucus, cellular debris, and bacteria and you have some . . . excrement (I'm struggling here!) Vets seem to be obsessed with scat (surely not all of them, Erica?), because observation of feces can help determine the state of the digestive tract, stress levels, various disease processes, hydration status, and reveal the presence of parasites. With the picture of a horned frog having just . . . defecated, Erica told us that vets stare at poop. How they stare at it filled the next slide. Vets and vet techs use fecal floats, sedimentation, acid fast staining, PCR, gram stains and direct smears to probe the mysteries of manure. None of those could be as fun as they sound, but Erica told us which are used most and for what. And she gave us instructions for the care and handling of the samples. The fresher the better. If a sample can't be run within two hours, wrap it in plastic or foil and refrigerate it. It should last 6–8 hours. Don't freeze the samples. Samples run for *Giardia* and trichomonads should be run within thirty minutes. Protozoans and trophozoites are delicate and fragile and are best tested for within a few hours.

The next slide was another *The Good, the Bad, and the Ugly* poster featuring Clint Eastwood and introducing "our feature presentation." The good (illustrated with a picture of Clint, for whom Erica seems to have a certain fondness) included the microbiome (or normal intestinal flora) consisting of gram-negative anaerobic and some gram-positive bacteria that ferment unused energy substances, train the immune system, prevent growth of harmful bacteria, regulate the development of the gut, produce vitamins, and produce some hormones that direct the host to store fat. Intestinal fauna should only exist in herbivores and some omnivores, mainly chelonians and lizards. Ciliated protozoa, which Erica declared cute, help break down vegetable matter.

A picture of Lee Van Cleef naturally proceeded the bad intestinal denizens. Parasites can cause such symptoms as poor appetite, vomiting, abnormal stool, constipation, weight loss, and diarrhea. Most are protozoa and are more common in wild-caught animals than captive-bred, but pinworms and other nematodes (or roundworms) can also cause complications for your animals' health. If your tortoise is prone to diarrhea it may be suffering from a yeast overgrowth—usually caused by a diet high in fruits.

Staying with her theme, Erica showed a slide of Eli Wallach to start off her section on the ugly, or how good feces and bad feces should appear. She explored defecation quirks such as leopard geckos tending to defecate in one spot and the typical

frequency of defecation by various animals. We saw a slide of what diarrhea looks like (it's not just loose stool!) and feasted our eyes on results of constipation and inspissation among other abnormalities. Erica showed us photos of green feces and black feces, mummified feces and urates. Inspissation is the result of feces becoming thickened and dried from sitting in the colon too long and can lead to blockage and even rupture. Red-tailed boas and other large constrictors may suffer inspissation as a result of being fed too large prey. Erica suggested that always feeding your animal the largest prey it can handle may not be a good idea. If an herbivore's or omnivore's feces are green, this may simply be the result of eating turnip or mustard greens and is usually not harmful.

Urates, unless they are a "cool" color other than white, should be excluded from a fecal sample requested by the vet. Erica claimed that she's actually used the chalklike urates of some animals to write with and suggested the audience try. I think I'll pass. In answer to a question about refreezing uneaten rodents, Erica said to avoid refreezing any that had changed color.

Sitting through a presentation about excrement may not be anyone's idea of a good time, but with wit and much knowledge, Erica Mede drew a huge crowd to a fine overview of an important part of husbandry. It may not be everyone's cup of tea, but feces are an important indicator of your animal's health and well-being. Erica could not and didn't try to make diagnosticians out of us, but her grasp of the subject and her handling of the presentation did give all of us a better idea of what to consider while we're cleaning our animals. At one point in her presentation, after one of her slides of the movie came on screen, she checked to see how many of us had seen *The Good, the Bad, and the Ugly*. She wanted confirmation that she was "not the only one who thought she was hilarious." I can assure her that she wasn't. She had a lot of good . . . stuff.

Bull. Chicago Herp. Soc. 48(8):112, 2013

The Tympanum

We are writing to express our sincere thanks for the Chicago Herpetological Society's 2013 contribution of US$1,000 to support the global coordination of the Amphibian Ark. Amphibians are a critical part of healthy ecosystems and your contribution will help us protect those in danger of extinction. We are very grateful for your support.

As a joint effort of the World Association of Zoos and Aquariums, the IUCN/SSC Conservation Breeding Specialist Group, and the IUCN/SSC Amphibian Survival Alliance, the Amphibian Ark is working to facilitate the response of the zoo and aquarium community to the current amphibian extinction crisis. As you know, more than a third of amphibian species are threatened, with many facing imminent extinction if no actions are taken. For those amphibian species that cannot currently be saved in nature, the Amphibian Ark is coordinating with zoos, aquariums, and other institutions around the world to place these animals in biosecure facilities for safekeeping and breeding until the threats to the wild populations can be controlled. We help to provide the needed coordination of these efforts, along with training, technical assistance, and publicity that will help all organizations to conduct effective and efficient amphibian conservation programs. Since 2006, we have assessed 43% of all amphibian species (64% of the threatened amphibian species) for their conservation needs. We are currently tracking over 130 priority amphibian species in captivity. Our ultimate vision is *the world's amphibians safe in nature*.

You can find out more about our activities by visiting our web-site www.amphibianark.org and reading our 5 year report here www.amphibianark.org/pdf/AArk-5-year-report.pdf.

We have been able to respond appropriately and quickly to this high profile conservation crisis because we have support from organizations such as yours. With your help and commitment, the Amphibian Ark will continue to help the ex situ community use their considerable expertise to help amphibians. Thank you again for your valued contribution.

Most sincerely,

Lena M. Lindén, World Association of Zoos and Aquariums
Phil Bishop, Amphibian Survival Alliance
Onnie Byers, Conservation Breeding Specialist Group,
AArk Executive Committee Chair

Herpetology 2013

In this column the editorial staff presents short abstracts of herpetological articles we have found of interest. This is not an attempt to summarize all of the research papers being published; it is an attempt to increase the reader's awareness of what herpetologists have been doing and publishing. The editor assumes full responsibility for any errors or misleading statements.

AUTOMATED RADIO TELEMETRY FOR SNAKES

M. P. Ward et al. [2013, J. Herpetology 47(2):337-345] evaluated an automated telemetry system that can dramatically increase the amount of activity and spatial data collected for snakes. They developed methods for analyzing data from single automated receiving units (ARUs) and ARU arrays, compared results from ARUs with conventional hand tracking, and assessed previously untested assumptions used in conventional telemetry, using data from ratsnakes (*Pantherophis* spp.) in Texas and Illinois. ARU data indicated that ratsnakes spent most of their time in small home ranges (mean = 25 ha) but engaged in forays of up to 1.5 km from their core-use areas, suggesting this species may engage in central place foraging. Forays inflated home-range sizes greatly if areas were estimated using minimum convex polygons rather than 95% kernels. Large numbers of locations generated by ARUs produce more reliable home-range estimates than those from hand tracking. ARU data indicated that snakes moved in response to observers during hand tracking. Daily hand tracking produced reliable estimates of distances moved but underestimated distances by a factor of 4 when snakes were tracked every 5 days. Drawbacks of ARUs are that the error associated with individual locations exceeds that for hand-tracked locations and that the costs exceed those for hand tracking. Automated receivers can increase data greatly from radio-tracked snakes, providing novel insights unavailable from conventional hand tracking. There are drawbacks to this technology, some of which will vary among study species; therefore, researchers should evaluate the appropriateness of the technology for both the study species and the questions being asked.

BROWN ANOLES RESPOND TO BIRD CALLS

L. R. Cantwell and T. G. Forrest [2013, J. Herpetology 47(2):293-298] note that many studies indicate that various vertebrates and invertebrates use sensory cues to recognize predators and to evaluate predation risk. Lizards and birds frequently occupy the same habitats; consequently, avian predation on lizards has been implicated as an important selective pressure on lizard behavior. However, there are few studies on how lizards respond to nonvisual cues. The response of adult male brown anoles (*Anolis sagrei*) to calls of birds was studied to determine whether they use auditory cues as an indicator of predation risk from birds. Anoles responded significantly more often with head tilt (increased vigilance) during playback of predatory vocalizations (kestrel and red-tailed hawk calls) compared with low-risk stimuli (nonpredatory bird calls and white noise). Responses to auditory cues suggest that male brown anoles are able to distinguish the calls of birds known to prey upon lizards from the calls of nonpredatory birds. More important, this study demonstrates that anoles, most of which are nonvocal, are able to obtain information about predation risk through the use of auditory cues and that the role of hearing in these lizards has been underappreciated.

BULLFROG TADPOLES SHOW PERSONALITY

B. E. Carlson and T. Langkilde [2013, J. Herpetology 47(2): 378-383] note that variation in personality traits is observed commonly in many taxa but has been rarely studied in amphibians. They tested whether individual bullfrog tadpoles exhibit personality, behaving consistently across multiple trials, and differently from conspecifics. From video footage of individual tadpoles in a familiar (home) environment and a novel environment (open field), we obtained measures of their level of activity, boldness, and exploration behavior over multiple trials. We found that activity level did not differ consistently between individuals. Boldness was moderately repeatable and exploration highly repeatable within individuals across trials, but only exploration varied significantly among individuals. These findings provide evidence of typical personality traits in tadpoles and support the value of bullfrog tadpoles as model organisms in personality research.

AQUATIC TURTLES AND GOLF COURSE PONDS

S. J. Price et al. [2013, J. Herpetology 47(2):243-250] note that golf courses represent a common type of anthropogenically modified habitat in suburban environments. Golf courses may provide suitable habitat for semi-aquatic animals in suburban areas, yet studies comparing animal abundances in golf course ponds with other pond types in suburban environments are somewhat limited. The authors compared turtle abundances in golf course ponds with ponds found in residential areas and ponds found in rural (farm) areas, and examined the relationship between turtle abundance and residential land-cover within individual golf courses. They captured turtles in 10 golf course ponds, 5 ponds surrounded by residential development, and 5 ponds located on farms. They estimated abundance and the effects of pond area, pond type (i.e., residential, golf, farm) and percentage of residential development within golf course boundaries. Using binomial mixture models and Bayesian inference, it was found that ponds surrounded by residential development had lower abundances of painted turtles (*Chrysemys picta*) and sliders (*Trachemys scripta*) than ponds located on golf courses and farms. Additionally, golf courses that have a greater amount of residential development within course boundaries had fewer turtles than courses that contained minimal residential development. These results suggest that golf courses can offer suitable habitat for semi-aquatic turtles in suburban areas. However, residential development within golf course boundaries appears to have a negative effect on local abundances. Thus, if golf courses are to be seen as reserves for wetland-dependent animals, golf courses with low housing density should be considered as a more preferable option than courses associated with extensive residential development.

SUSCEPTIBILITY TO CHYTRIDIOMYCOSIS

M. E. Ortiz-Santaliestra et al. [2013, J. Herpetology 47(2): 286-292] note that *Batrachochytrium dendrobatidis* (Bd), the fungus responsible for chytridiomycosis, grows on the keratinized parts of the body (i.e., the entire skin of juveniles and adults, and the oral disk of tadpoles). The fungus affects epidermal structures, generating an imbalance of the osmotic equilibrium through the skin that ultimately leads to death. Therefore, larvae are likely to be much more resistant compared with juveniles and adults, which may suffer high mortality. However, nothing is known about how susceptibility varies during the juvenile life stages (from the end of metamorphosis to sexual maturity). The coexistence of tolerant hosts (either tolerant species or unaffected developmental stages) with susceptible hosts is a major reason why chytridiomycosis has become an epidemic disease. The aim of this study was to analyze the interspecific and developmental variation in susceptibility to Bd in juveniles of three North American anurans. Leopard frog (*Lithobates pipiens*) incurred no lethal effects at 104 Bd zoospores ml^{-1}, regardless of the age at which they were exposed to the fungus. On the contrary, Bd infection was more severe for newly metamorphosed juveniles of American toads (*Anaxyrus americanus*) than for 4-week-old juveniles. When exposed to 104 Bd zoospores ml^{-1}, newly metamorphosed juveniles of this species experienced mortality rates above 70%, whereas 4-week-old juveniles had mortality rates below 30%. Variations in structural characteristics of the skin or the antifungal efficiency of skin peptides are proposed as potential reasons to explain the observed developmental differences in susceptibility to Bd.

CONSERVATION GENETICS OF CRAWFISH FROGS

S. O. Nunziata et al. [2013, J. Herpetology 47(2):361-368] note that crawfish frogs (*Lithobates areolatus*) are a North American ranid, considered near threatened globally with populations in decline throughout their range. They studied populations of crawfish frogs on local and regional scales at their northeastern range limit to (1) assess the level of genetic diversity within populations, (2) estimate fine-scale genetic structure, and (3) estimate genetic differentiation between populations at the regional level. They used 10 microsatellite loci to genotype frogs collected from three regional sites in Indiana separated by 50–172 km and at one of these sites within a network of three breeding ponds <1 km apart. Heterozygosity estimates revealed high levels of diversity within these populations, which is encouraging for future management. The degree of population subdivision was low at the regional level. Genetic differentiation was related to geographic distance between sampling sites, as predicted by an isolation-by-distance model. They observed no genetic differentiation between individuals sampled from ponds approximately 250 m apart and slight divergence of individuals from a pond approximately 750 m away. This suggests ponds within 1 km form a genetically distinct single breeding unit composed of multiple subpopulations. Finally, they saw high genetic differentiation between southwest and southeast Indiana sites indicating historical (rather than recent) isolation of these sites. These data will be applied to a regional management plan in an attempt to recover crawfish frogs along the northeastern extreme of their range.

LEATHERBACK NESTING BEACHES

J. H. Roe et al. [2013, Chelonian Conservation and Biology 12(1):34-43] note that coastal development can alter the natural dynamics of beach environments, with strong implications for associated biota. Sea turtles nest on oceanic beaches and often depend upon a specific range of conditions for successful nesting. In the case of the critically endangered leatherback turtle (*Dermochelys coriacea*), little is known regarding what features they select for nest sites, including how they respond to anthropogenic development. The authors examined relationships between leatherback nest frequency, beach environments, and tourism development at Playa Grande, Costa Rica, the location of the largest current nesting population in the eastern Pacific Ocean. Developed beach sections had shallower slopes, lower pH, and less air-filled pore space, but higher water content and salinity than undeveloped areas. Developed areas were also comprised of more sand in the smaller grain size classes relative to undeveloped sections. Leatherback nesting was positively correlated with deepness of the offshore approach, beach slope and elevation, pH, and sand in intermediate size classes (0.025-mm diameter), but negatively correlated with sand in the smallest silt size class (< 0.0625-mm diameter). Leatherback nesting frequency was 3.4 times higher in undeveloped sections of the beach relative to developed areas, while nonnesting emergences were 2.6 times more likely in developed relative to undeveloped areas. It is apparent that coastal development has impacted beach environments with consequences for leatherback nest site distribution. It is likely that additional development of the beach under mixed-management plans to support a growing tourist industry will further degrade the attractiveness and quality of the beach for leatherback nesting.

FISH AND FERTILIZER AFFECT TADPOLES

G. R. Smith et al. [2013, Copeia 2013(2):248-253] note that invasive fish frequently negatively affect amphibian populations around the world. In agricultural regions of the world, the effects of invasive fish on amphibians may coincide with pollution by agricultural fertilizers. They conducted a mesocosm experiment to examine the potential independent and interactive effects of introduced western mosquitofish (*Gambusia affinis*) and ammonium nitrate, an agricultural fertilizer, on green frog (*Lithobates clamitans*) tadpoles. Mosquitofish had a negative effect on the survivorship of green frog tadpoles. Green frog tadpoles from mesocosms with mosquitofish were larger than tadpoles from mesocosms without mosquitofish, possibly due to a thinning effect that reduced intraspecific competition, as well as increased primary productivity. Ammonium nitrate additions did not affect survivorship in green frogs. However, green frog tadpoles in ammonium nitrate addition treatments were larger than those from treatments without ammonium nitrate addition, possibly due to increased phytoplankton abundance. In conclusion, mosquitofish and ammonium nitrate addition each had independent and additive effects on green frog tadpoles, but there was no evidence for significant interactions between these two stressors. The results suggest that environmental stressors can have additive effects in some systems and that introduced fish predators may have greater impacts on amphibian populations than low level chemical contamination.

Unofficial Minutes of the CHS Board Meeting, July 19, 2013

The meeting was called to order at 7:42 P.M. at the Schaumburg Public Library. Board members Stephanie Cappiello, Jim Foster, Lawrence Huddleston and Cindy Rampacek were absent.

Officers' Reports

Recording Secretary: The minutes of the June 14 board meeting were read, discussed and accepted.

Treasurer: The June financial report was discussed and accepted.

Membership Secretary: Numbers are holding at just under 500. The list of expiring memberships was read.

Committee Reports

Shows:
- Notebaert Nature Museum, first full weekend of each month.
- Argonne Labs picnic, July 20
- Museum of Science and Industry Members' Night, July 24.
- SEWERFest, August 4.
- Red Oak Nature Center, Bug Fest, August 24.
- Notebaert Nature Museum Trivia Night, 6–9 P.M., August 27.

Old Business

Herps of Illinois: The group discussed formalizing a policy in regard to herps collected from the wild to exhibit at ReptileFest. Bob Bavirsha will draft a letter to contact nature centers regarding housing native species after 'Fest. We also need to look at adding this policy to 'Fest guidelines.

Membership brochures/cards: Mike has had more membership brochures printed.

Lavalier microphone system: Andy will order the system that Josh has recommended and have it shipped to Mike's office.

New Business

Updating websites for CHS and ReptileFest: We are looking for volunteers to work on updating both websites.

Meeting attendance—general and board: We need ideas to increase attendance at our meetings.

BOD resignation: Lawrence Huddleston has resigned his position on the board. Jason appointed Dick Buchholz to fill his position for the rest of the year.

Chicago Wilderness: Mike moved to continue our membership. Linda seconded, and the motion passed unanimously.

December general meeting: The December meeting date has been changed from the last Wednesday, which falls on the 25th, to Thursday, December 26.

Round Table

Bob Bavirsha has fox snake eggs, and showed a photo, wondering if they are good.

Aaron mentioned that SEWERFest sold more tables this year than ever before.

Mike Dloogatch noted that the CHS received review copies of a field guide to the reptiles and amphibians of Costa Rica, in both English and English/Spanish versions, published by Cornell. He recommended them.

Nancy Kloskowski brought samples of her artwork to the board meeting.

The meeting was adjourned at 9:24 P.M.

Respectfully submitted by Jenny Vollman

Advertisements

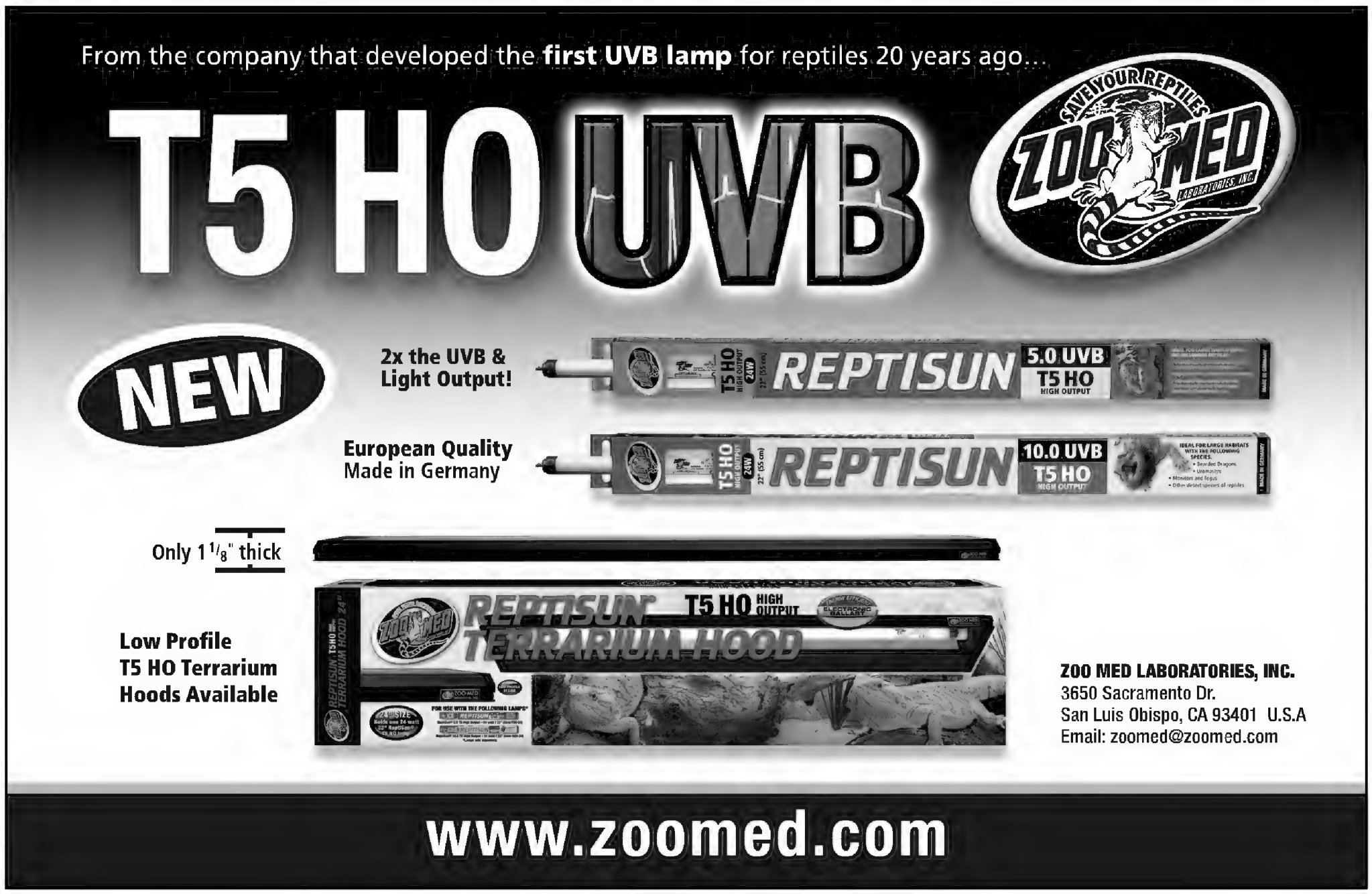
For sale: rats and mice—pinkies, fuzzies and adults. Quantity discounts. Please send a SASE for pricelist or call Bill Brant, *THE GOURMET RODENT*, PO Box 430, Newberry, FL 32669-0430, 352-472-9189, E-mail: GrmtRodent@aol.com.

For sale: **highest quality frozen rodents**. I have been raising rodents for over 30 years and can supply you with the highest quality mice available in the U.S. These are always exceptionally clean and healthy with no urine odor or mixed in bedding. I feed these to my own reptile collection exclusively and so make sure they are the best available. All rodents are produced from my personal breeding colony and are fed exceptional high protein, low fat rodent diets; no dog food is ever used. Additionally, all mice are flash frozen and are separate in the bag, not frozen together. I also have ultra low shipping prices to most areas of the U.S. and can beat others shipping prices considerably. I specialize in the smaller mice sizes and currently have the following four sizes available: Small pink mice (1 day old—1 gm) , $25 /100; Large pink mice (4 to 5 days old—2 to 3 gm), $27.50 /100; Small fuzzy mice (7 to 8 days old—5 to 6 gm) , $30/100; Large fuzzy mice / hoppers (10 to 12 days old—8 to 10 gm), $35/100 Contact Kelly Haller at 785-234-3358 or by e-mail at kelhal56@hotmail.com

For sale: High quality, all locally captive-hatched tortoises, all bred and hatched here in the upper midwest. Baby leopards, Sri Lankan stars, and pancakes usually available, and are all well-started and feeding great! Leopards are $125 ea., Sri Lankans (2012 hatched) $475 ea. And Pancakes are $195 ea. Leopards for out of state sale/shipping require a veterinary health certificate (inquire for cost). E-mail at KKranz1@wi.rr.com or call Jim or Kirsten at 262 654 6303.

Herp tours: **Costa Rica herping adventures**. Join a small group of fellow herpers for 7 herp-filled days. We find all types of herps, mammals, birds,and insects, but our target is snakes. We average 52 per trip, and this is our 10th year doing it. If you would like to enjoy finding herps in the wild and sleep in a bed at night with air-conditioning, hot water and only unpack your suitcase once, instead of daily, then this is the place to do it. Go to our web-site http://hiss-n-things.com and read the highlights of our trips. Read the statistics of each trip and visit the link showing photos of the 40 different species we have found along the way. E-mail at jim.kavney@gmail.com or call Jim Kavney, 305-664-2881.

Line ads in this publication are run free for CHS members—$2 per line for nonmembers. Any ad may be refused at the discretion of the Editor. Submit ads to mdloogatch@chicagoherp.org.



UPCOMING MEETINGS

The next meeting of the Chicago Herpetological Society will be held at 7:30 P.M., Wednesday, August 28, at the Peggy Notebaert Nature Museum, Cannon Drive and Fullerton Parkway, in Chicago. **Desiree Wong** will be sharing her experiences from the Shedd Aquarium's Iguana Research Expedition to Andros, Bahamas, earlier this year. Desiree started out as a hobbyist, making small contributions to green iguana keeping. Eventually, a trip to Grand Cayman and experiences with the Grand Cayman blue iguanas led her to become actively interested in conservation. For a number of years, she promoted reptile and amphibian conservation via the International Reptile Conservation Foundation, performing education and outreach at reptile shows across the county. She hopes to continue making contributions to *Cyclura* species conservation, with future trips planned to the Carribean and Bahamas.

At the September 25 meeting, **Justin Julander**, co-author of *The Complete Carpet Python*, will be talking about these and other Australian herps.

The regular monthly meetings of the Chicago Herpetological Society take place at Chicago's newest museum—the **Peggy Notebaert Nature Museum**. This beautiful building is at Fullerton Parkway and Cannon Drive, directly across Fullerton from the Lincoln Park Zoo. Meetings are held the last Wednesday of each month, from 7:30 P.M. through 9:30 P.M. Parking is free on Cannon Drive. A plethora of CTA buses stop nearby.

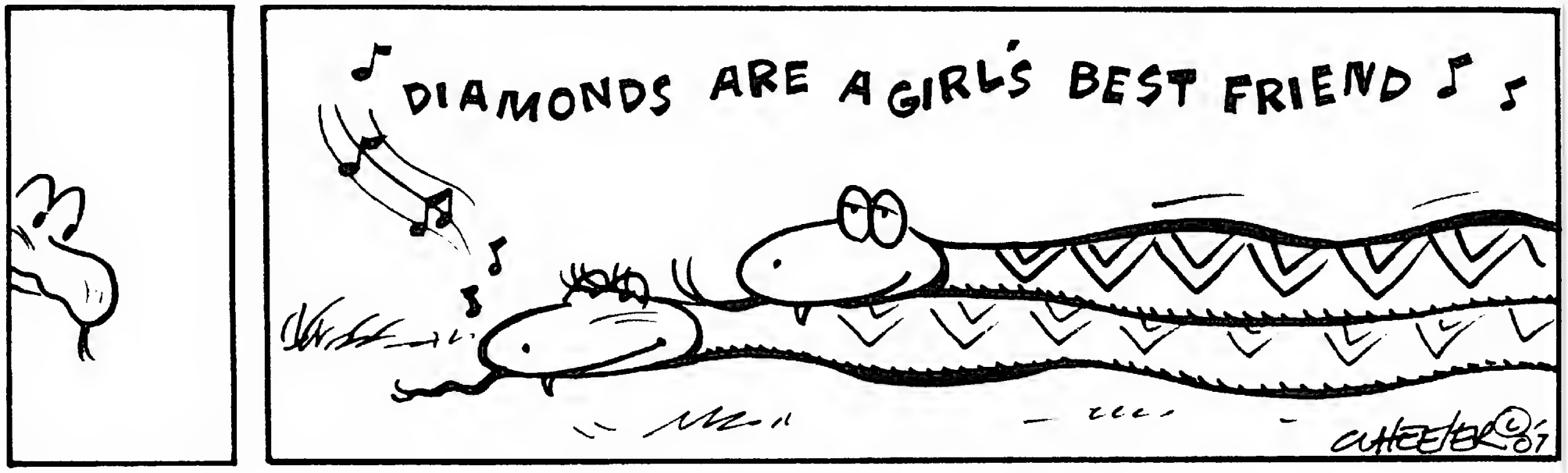
Board of Directors Meeting

Are you interested in how the decisions are made that determine how the Chicago Herpetological Society runs? And would you like to have input into those decisions? If so, mark your calendar for the next board meeting, to be held at 7:30 P.M., September 13, in the adult meeting room on the second floor of the Schaumburg Township District Library, 130 S. Roselle Road, Schaumburg..

The Chicago Turtle Club

The monthly meetings of the Chicago Turtle Club are informal; questions, children and animals are welcome. Meetings normally take place at the North Park Village Nature Center, 5801 N. Pulaski, in Chicago. Parking is free. For more info visit the group's Facebook page.

THE ADVENTURES OF SPOT



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BULLETIN
of the
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September 2013

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Notes on the Herpetofauna of Western Mexico 10: Herpetofauna of the Protected Natural Area "Estero El Salado" and Adjacent Areas in Puerto Vallarta, Jalisco, Mexico . . . . . Daniel Cruz-Sáenz, Ángeles Penilla-Juarez and David Lazcano 117

From City Girl to Field Biologist in 3 Months . . . . . Stephanie Cappiello 120

Frog City: IX. Only Herpetology, or, What Frogs Do for Me . . . . . Ilene Sievert 121

The Tympanum . . . . . William B. Montgomery 122

What You Missed at the August Meeting . . . . . John Archer 123

Herpetology 2013 125

Unofficial Minutes of the CHS Board Meeting, August 16, 2013 127

Advertisements 128

Cover: Andros Island iguana, *Cyclura cychlura cychlura*. Photograph by Desiree Wong.

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Notes on the Herpetofauna of Western Mexico 10: Herpetofauna of the Protected Natural Area "Estero El Salado" and Adjacent Areas in Puerto Vallarta, Jalisco, Mexico

Daniel Cruz-Sáenz [1], Ángeles Penilla-Juarez [2] and David Lazcano [3]

Abstract

With the objective to update the amphibian and reptile species richness of the protected natural area "Estero El Salado," surveys were conducted in different vegetation types to appraise the diversity of these sites. The biological richness represented in this natural protected area is important because the area is dedicated to protecting the mangroves and other vegetation that has high species richness.

Resumen

Con el objetivo de actualizar y dar a conocer la riqueza de anfibios y reptiles del área natural protegida en el "Estero El Salado" fueron realizados muestreando en los diferentes tipos de vegetación con la intención de representar todas las condiciones de esta área. Esta área natural protegida está dedicada a proteger al manglar, y la vegetación adyacente, juntos tienen una alta riqueza de especies.

Introduction

"Estero El Salado" is an urban island of only 200 ha, surrounded by the city of Puerto Vallarta; avenues and streets demarcate the area (Figure 1). This circumstance is important because the gene pool is limited for any amphibian or reptile species found there.

Other problems are the feral fauna species coming from the surrounding neighborhoods; cats and dogs move into the protected natural area and have a high impact due to hunting the local fauna (Dickman, 1996). The greatest threat is an overpopulation of raccoons (*Procyon lotor*), and it has been documented that when the raccoon population increases herpetofaunal populations like iguanas decrease due to this invasive predator (Meshaka, 2009).

Materials and methods

Study site

The protected natural area "Estero El Salado" is in the municipality of Puerto Vallarta, Jalisco, Mexico. This area is surrounded by the city of Puerto Vallarta. It's like an island of 200 ha.

In this protected area 99 species of bird, 24 of amphibians and reptiles and 17 of mammals have been reported.

Vegetation types

Semideciduous forest: fig tree (*Ficus padifolia*), *torote* (*Bursera arborea*), cohune palm (*Attalea cohune*), shortleaf fig tree (*Ficus citrifolia*), southern cattail (*Typha domingensis*),

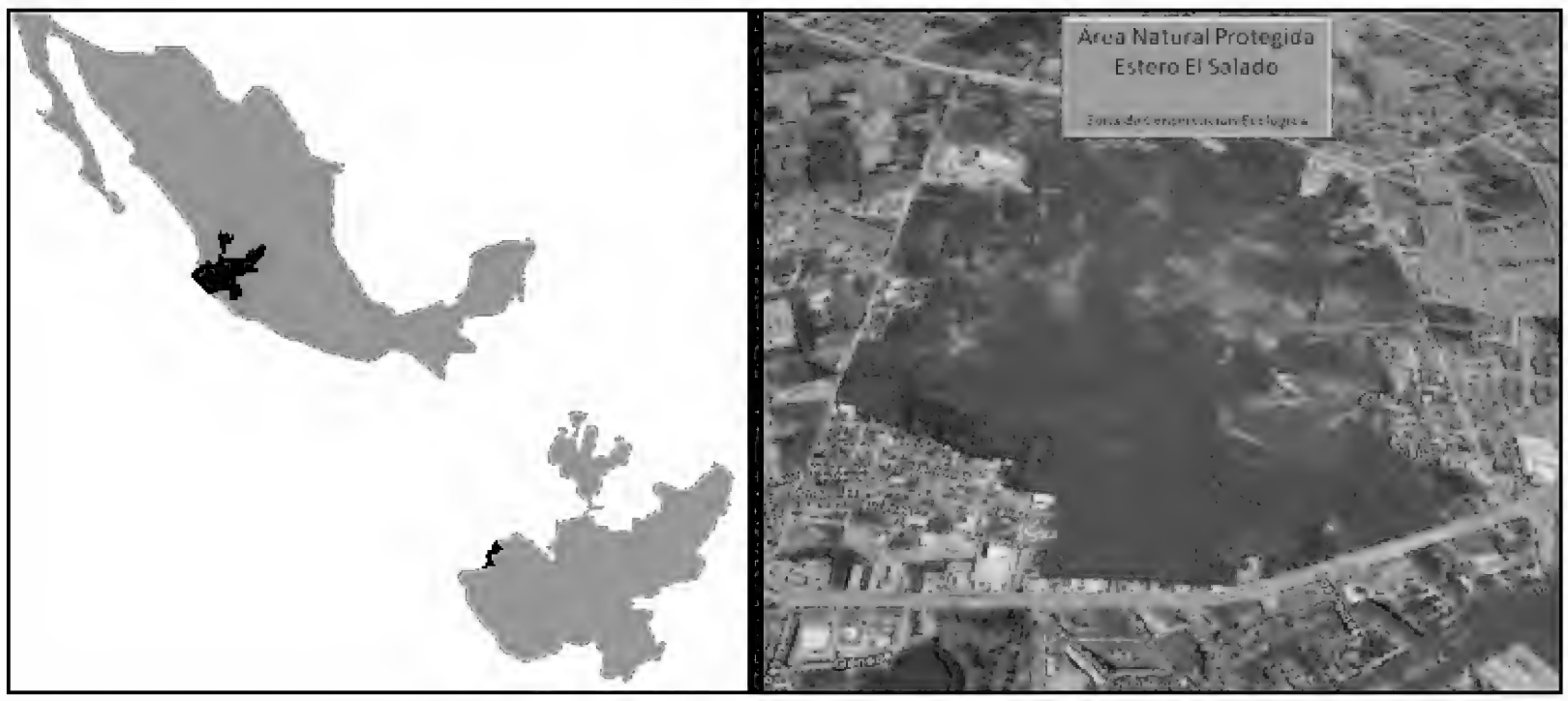

Figure 1. Location of "Estero El Salado."

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Table 1. Amphibian and reptile species from "Estero El Salado". Vegetation types: SDF = semideciduous forest; MF = mangrove forest; HG = halophytic grassland; TF = thorn forest. Protection categories based on Norma Oficial Mexicana (NOM-SEMARNAT-059-2010): A = Amenazada (Threatened), Pr = Protección Especial (Special concern). Endemism status: EM = Endemic to Mexico.

Species	Vegetation type				Protection NOM-2010	Endemism
	SDF	MF	HG	TF		
Cane Toad, *Rhinella marina*	X	X	X		-	
Blunt-toed Chirping Frog, *Syrrhophus modestus*	X			X	Pr	EM
Mexican Treefrog, *Smilisca baudinii*	X				-	
Dwarf Mexican Treefrog, *Tlalocohyla smithii*				X	-	EM
Forrer's Leopard Frog, *Lithobates forreri*	X			X	Pr	
Common House Gecko, *Hemidactylus frenatus*	X			X	-	
Lane's Leaf-toed Gecko, *Phyllodactylus lanei*	X				-	EM
Brown Basilisk, *Basiliscus vittatus*	X				-	
Western Spiny-tailed Iguana, *Ctenosaura pectinata*	X	X	X	X	A	EM
Green Iguana, *Iguana iguana*	X	X	X	X	Pr	
Black-nosed Lizard, *Sceloporus melanorhinus*			X	X	-	
Large-scaled Spiny Lizard, *Sceloporus utiformis*				X	-	EM
Tropical Tree Lizard, *Urosaurus bicarinatus*			X		-	EM
Schmidt's Anole, *Norops schmidti*	X	X		X	-	EM
Many-lined Whiptail Lizard, *Aspidoscelis lineatissima*	X			X	Pr	
Boa Constrictor, *Boa constrictor*		X		X	A	
Neotropical Whipsnake, *Coluber mentovarius*				X	A	EM
Central American Indigo Snake, *Drymarchon melanurus*				X	-	
Speckled Snake, *Drymobius margaritiferus*				X	-	
Southwestern Cat-eyed Snake, *Leptodeira maculata*				X	Pr	
Pacific Coast Parrot Snake, *Leptophis diplotropis*				X	A	EM
Mexican West Coast Gartersnake, *Thamnophis valida*				X	-	
Brown Vinesnake, *Oxybelis aeneus*				X	-	
Western Thread Snake, *Rena humilis*	X				-	
Pond Slider, *Trachemys scripta*		X			Pr	
American Crocodile, *Crocodylus acutus*		X			Pr	

umbrella sedges (*Cyperus* spp.), water primrose (*Ludwigia peploides*), primrose-willow (*Ludwigia* sp.), pencil willow (*Salix humboldtiana*), and giant cane (*Arundo donax*). Other common species in the area are *mata raton* (*Cayaponia attenuata*) and seasonvine (*Cissus verticillata*). This vegetation type covers just 2 km^2.

Thorn forest: Thorn forest components form a kind of barrier between the mangroves. Among the most common species we have recorded: *guamuchilillo* (*Pithecellobium dulce*), white thorn (*Pithecellobium lanceolatum*) *mezquite salado* (*Prosopis juliflora*), *iguanero* (*Celtis iguanaea*), *jarretadera* (*Acacia hindsii*) and *guásima* (*Guazuma ulmifolia*). In open sites in this community are trees such as white mangrove (*Laguncularia racemosa*) *mezquite salado* (*Prosopis juliflora)* and falseteeth (*Capparis flexuosa*).

Mangrove: Mangrove vegetation is the most abundant and widely distributed vegetation type—135 km^2. Some species in this type of vegetation include red mangrove (*Rhizophora mangle*), white mangrove (*Laguncularia racemosa*) and black man-

Dwarf Mexican treefrog, *Tlalocohyla smithii*. Photograph by Daniel Cruz-Sáenz.

Table 2. Species richness by vegetation type

Vegetation type	Amphibians	Reptiles
Semideciduous forest	4	8
Mangrove forest	1	6
Halophytic grassland	1	4
Thorn forest	1	15

grove (*Avicennia germinans*). These species are protected by Mexican environmental law (SEMARNAT, 2010).

Halophytic grassland: This is a plant community that forms large patches consisting primarily of grasses dominated by marine couch (*Sporobolus splendens*) as well as saltwort (*Batis marítima*), sea purslane (*Sesuvium portulacastrum*), alkali love-grass (*Eragrostis obtusiflora*), among others. This vegetation type covers an area of 32 km^2.

Sampling

Surveys were conducted in the different vegetation types with the aim of determining the richness of amphibian and reptile species.

The surveys were performed using 500-m band transects and intensive searching for individuals in all the possible micro-habitats for the species: ground, trees, fallen logs, bark, etc.; some surveys were conducted at night searching for amphibians.

Results

After two years of monitoring the herpetofauna of "Estero El Salado" we registered 26 herpetofaunal species of which five are amphibians and 21 are reptiles. Amphibians are represented by one order, four families and five genera. Two species are protected by Mexican environmental law (SEMARNAT, 2010) and two are endemic to Mexico (Table 1). Reptiles are represented by three orders, 11 families and 20 genera. Nine species are protected by Mexican environmental law (SEMARNAT, 2010) and seven are endemic to Mexico (Table 1).

The vegetation type with the highest richness of amphibian species was semideciduous forest. In the remaining areas only one species was found. For reptiles the greatest richness was found in the thorn vegetation followed by semideciduous forest (Table 2).

Discussion

This natural area is dedicated to protecting the mangroves and their wildlife inhabitants. This is because the majority of the surface is covered by mangrove. However we observed that the other types of vegetation covering a smaller area have higher species richness, particularly thorn vegetation and semideciduous forest (Table 2). Together with mangrove and adjacent vegetation types they have a rich biota, but the mangrove alone represents just a few species. The lower richness of the mangrove forest could be due to salinity and the poor food resources.

Acknowledgments

We wish to thank the Estero El Salado Administration. And we thank Universidad de Guadalajara for its financial support of this project, and biologist Alfredo Frías-Castro for characterizing the vegetation.

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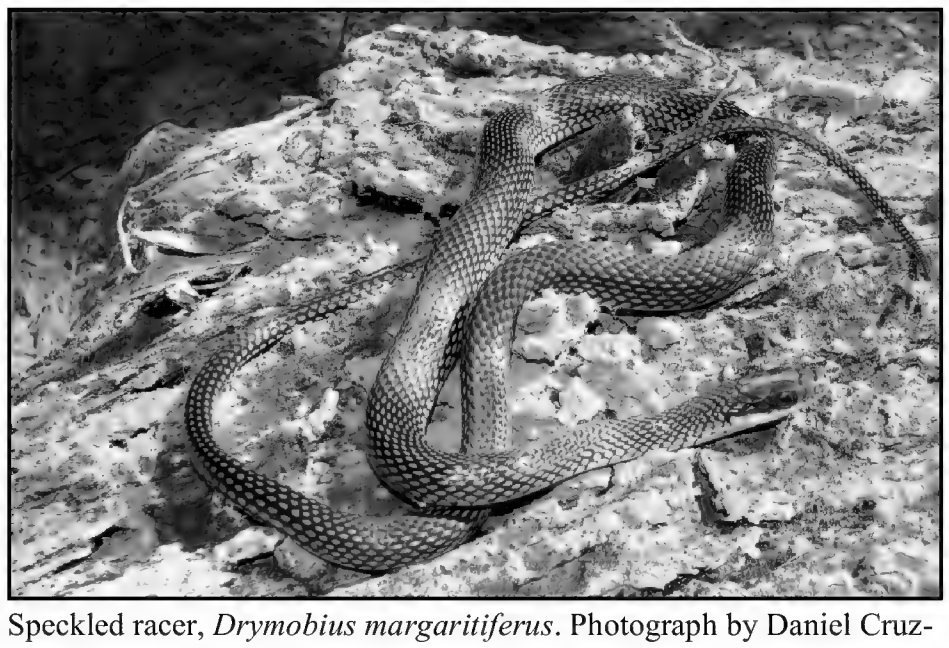

Speckled racer, *Drymobius margaritiferus*. Photograph by Daniel Cruz-Sáenz.

Mexican treefrog, *Smilisca baudinii*. Photograph by Daniel Cruz-Sáenz.

From City Girl to Field Biologist in 3 Months
by Stephanie Cappiello

Part 1: Terrapins

It was early May when I learned that I had only one week to prepare for my return to Sanibel Island, Florida, for what would be a physically and mentally challenging field biology internship. I had spent a week in March on Sanibel gathering data for a gopher tortoise research project at the invitation of a fellow CHS member whom I had met at the December holiday party. To say I was excited is an understatement. To say that I was not nervous would be a lie. I was born and raised in the city and never spent much time outdoors. In fact, I was scared of most bugs and would not swim due to an irrational fear of fish. As I packed my bags, I could not help but think, good thing Florida is filled with giant bugs and creepy saltwater fish.

On my first day of work at the Sanibel Captiva Conservation Foundation (www.sccf.org), my boss and fellow CHS member Chris Lechowicz, the director of habitat management, informed me that we were headed out to the mangroves to capture diamond-backed terrapins. We were taking part in a study to estimate the population size of the species in the area. As we arrived at the mangroves, I could not help but notice the overwhelming amount of spider webs. Back in Chicago, a lone spider in my room would send me screaming down the hall, demanding that my father kill it. When we arrived at the site, Chris told me to step into the mangroves and enter the water. As I approached the water, I noticed schools of fish swimming everywhere. *Great*, I thought, *I get to realize my two biggest fears all at once, bugs and fish*. The only thing that kept me from hopping on the next flight home, was the fact that I was about to have the experience of my life catching terrapins.

The first terrapin that came my way managed to evade my grasp by digging into the leaf litter. Much to Chris's dismay, I refused to stick my hands in the mud to retrieve the turtle. Therefore, the next few turtles snuck past me. The next day happened to be not only my second day in the mangroves, but also World Turtle Day. I was determined to catch a turtle. After a total of four hours in the water, I had caught three terrapins and was elated!

Every time we caught a turtle, we took body measurements, drilled the shell (for marking purposes), pit-tagged them, took pictures and released them. I was so nervous; I did not want to drill in the wrong spot and hurt one of them. Chris showed me how to pit-tag them and cautioned me to be careful since the needle was very sharp. Sure enough, I stabbed myself in the hand. I guess all jobs come with their own hazards! I was excited to find that the process quickly became quite smooth and I was really good at it. When we arrived back at the office, I processed the terrapin data.

Having reviewed his research on population size, Chris noticed that there had never been hatchlings or young turtles at our study site; so he received funding for two satellite transmitters. We wanted to attach the satellite transmitters to gravid females in order to track their nesting behaviors. The following week was spent in the mangroves for hours each day trying to catch gravid females. The more times I went, the less nervous I became and the more fun I had. It actually became addicting to catch turtles, and I even found myself freely jumping in the water after them.

Once we had caught the gravid females, we had to attach the transmitters, which was a real learning experience. I realized at that moment that I was part of groundbreaking research, as no one else had ever put this type of transmitter on a terrapin. Once the females were released, I was in charge of monitoring the data and tracking their movements. After working with the terrapins, I developed a new interest in aquatic turtles and thankfully am no longer afraid of fish!

To be continued . . .

The author wading through the mangroves in search of diamond-backed terrapins. Photograph by Chris Lechowicz.

The author holding a gravid female diamondback that has been outfitted with a satellite transmitter. Photograph by Chris Lechowicz.

Bull. Chicago Herp. Soc. 48(9):121-122, 2013

In fond remembrance of Ilene Sievert, who died December 16, 2012, this year we will reprint several of the essays that Ilene wrote for these pages between 1988 and 1993 under the rubric "Frog City." This one is from August 1992.

Frog City
by Ilene Sievert

IX. Only Herpetology, or, What Frogs Do for Me

It surely will amaze you, as it did me, that some criticism has been made on the publication of these essays. The subject matter has not always been appropriate for a serious journal of herpetology; too general or even too far afield. Rest easy, I am not at all hurt or even annoyed by this well-meaning guidance by utter asses and vicious bastards out to get me. After months of sulking in my tent, with all gracious good will I limit these paragraphs to one subject only; topics directly concerned with the glorious science which has captured world-wide love and interest. That's herpetology! [Enter high-kicking chorus of frogs hired from Phil Smidt's] Herpetology: the portmanteau of Linnaeus into which are shoved the more disagreeable productions of Nature so as to clear the desk for something pleasant, botany perhaps. Actually herpetology appears to be the study of vertebrate icky things that no one else, besides herpetologists, cares much about when not in cartoon or folktale form. It sometimes occurs to me that if baby turtles weren't so darn cute herpe-tologists would be driven out with cursing and long sticks. "I tell you Brethren, these people feed fuzzy bunnies to big snakes!"

As for myself, I most often find incredulity and condescending amusement. "You were where? Looking for what?

Oh Ilene, you're a stitch!"

Where was I—oh yes, herpetology; what fascinates and motivates its devotees? Several theories exist on why a certain minority of individuals have this particular interest. Perhaps these persons are sensitive, sensitive to the underfrog nature of the studied animals and wish to bless with love the otherwise unloved in the style of Mother Teresa. Or maybe they confront inward atavistic fears, driving out the racial memories by rationalizing the irrational and generally damping the bad vibes. Oh yes you do remember what "vibes" are. It has occurred to me that unpopular subjects attract fewer enthusiasts yielding less competition. Players of bassoon or harp have a less crowded field than students of violin or piano. Or elitism could move our herpetologist. Anyone (everyone!) can coo over a fuzzy bunny. Our herpetologist can be one of the very few to coo over gular flapping. Put simply, are fuzzy bunnies not good enough for you or, migosh, is it that you are not good enough for fuzzy bunnies?

A popular view on herpetologists is that they suffer from mild to moderate mental imbalance. One may cite such studies as "Small Women: Large Snakes" by Nevva More, and "Amphisbaenids in My Bedroom" by Mike Boobyhatch (also the author of "Accidental Underwater Photography"). And don't forget the most shocking revelations in "Secret Minutes of the Board" by Staci Quo.

My very dear reader, so precious because so rare, for you alone have I carefully and most methodically examined these and other theories, spoiling the good backs of many an envelope and forever invalidating grocery coupons used as bookmarks. But after much consideration and untold hours of pleasant daydreaming I concluded that not all persons interested in herpetology are sappy, arrogant or in great need of personal counseling. There are those who contribute to the sum of human knowledge, an activity needing no apology. But what of us who will never play in any concert hall, perhaps not even to a few neighbors? My personal opinion is that an interest in herpetology can be an important contributor to mental health and intellectual strength, regardless of the scientific publications not made.

"Why should this be so?", the young fellows ask. Let Grandma tell you.

One affliction of the latter part of life is that the fresh sense of wonder and delight dims down. Gray shades of experience, grief and fatigue can mute the bright colors that nourished the growth of our senses when we were children. We darken like old bronze monuments and need a little rubbing to bring out some highlights; perhaps also some washing off of poultry poop. Think of that picture that's been hanging in your living room, ignored. Once you thought it so lovely a wad of money was enchanted right out of your pocket. What can you do to reopen your eyes? A good look at something new, different, will recreate the old for you and transform the tiresome familiar. Details in the new will call forth correspondences on the old and rise up on the blank surfaces, and caves and mountains pop in and out of the former flatlands.

When you started your interest in herpetology, what attracted you? Did the forms of the creatures make you think of structural or behavioral adaptation? Or did venom chemistry catch your attention, or variations of vertebrate evolution, skeletal changes, or feeding patterns? What about population dynamics of predators and prey or effects of human changes on populations? Perhaps like most children you just thought herptiles were really neat looking and went on from there thinking about running along with no arms and legs looking for prey, absorbing your drink through your skin, or swallowing your food whole without chewing. I'll bet you thought about swallowing your food whole, you little rascal.

I think other living creatures, not forgetting plants, have a kind of poetry for us which in the case of herptiles is also a form of theater in which we envision ourselves as them and then step outside to observe. Any scientific knowledge, not very different from confirmed gossip about our relatives and friends, enriches the experience and encourages further in-volvement. Incidently, though I have envisioned myself as a large woody plant, never anything herbaceous let alone nonvascular, there are some folks who model themselves on fungus (particularly mold), or on

floating green algae of small, still bodies of water.

So, herpetology can be most anything you like, art or science, physics, chemistry, history, literature! or even music (brraaaaack). Why not bypass herpetology and go straight to these other disciplines? Beats me, except baby turtles are so darn cute. Besides, if you lift and restore a heap of trash you may find a snake or salamander but not a subatomic particle. A night by a pond with a flashlight is cheaper than Ravinia and no one talks through the music. An iguana may scratch your neck but it won't explode and burn off your eyebrows. A python swallowing a rat is less ugly than what's happening in Bosnia. Furthermore, fuzzy bunnies aggravate my allergies but turtle dander has never swollen my eyelids or triggered one sneeze.

Personally, things I can see, hold, and smell are more comprehensible than things I can't. Bacteria are too darn small and photons are out of the question. The probability of particle or wave* or the blood of St Januarius, it's all too mysterious. I agree that knowledge of these is basic to biological understanding (excepting the Saint, as a miracle is by definition an exception) but my confused thoughts are soon frustrated in attempts at independent conjecture on the basic topics of energy and matter. I'll be happy to take the latest received info at the popular level without argument, not the whole rodent at one time please. Give me a hitching post for my science and herpetology will do as well as any.

I told you I would stick strictly to herpetology.

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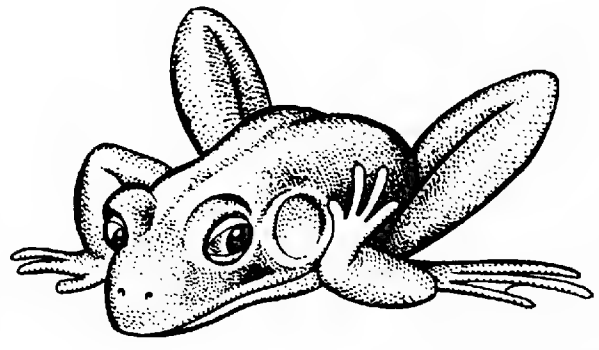
* Hey kids, try this! Get three pairs of polarized sunglasses, clip-ons are the easiest, a flashlight, and a white screen to cast your flashlight beam upon. The screen can be a white wall or piece of paper. Shine your flashlight on the screen to make a round white spot of light. Then hold your first pair of sunglasses horizontally so the beam passes through a lens. Hold the second pair vertically in front of the first pair so that the beam passes through both pairs. What do you see? Now have someone take the third pair of sunglasses to hold between the other two pair. First hold it horizontally like the first pair, then vertically like the second. Then finally hold it at a diagonal angle to the other two pair. What do you see? Ask Dad to explain why.

Bull. Chicago Herp. Soc. 48(9):122, 2013

The Tympanum



The article by Dave Barker (CHS Bulletin, Volume 48, Number 8, August 2013) on the snake-killing garden netting was excellent and timely. I would like to point out another deadly product which incorporates the very same netting; straw erosion control blankets, the most common brand being Curlex. We used some of this several years ago to stop erosion on our land while waiting for the grass seed to germinate underneath it. These blankets are composed of a mat of straw held together on both sides by nylon netting and comes in 4' × 100' rolls. To our dismay, we started finding dead snakes, including copperheads (*Agkistrodon contortrix laticinctus*), Eastern hognose snakes (*Heterodon platirhinos*) and Eastern yellow-bellied racers (*Coluber constrictor flaviventris*), entangled in the netting. I subsequently dumped several loads of sand on top of the blankets which fixed the problem.

As this material is commonly used in landscaping, sometimes on a huge scale, it must certainly cause the deaths of countless snakes and other small animals. **William B. Montgomery, crotalus53@gmail.com**

Bull. Chicago Herp. Soc. 48(9):123-124, 2013

What You Missed at the August Meeting

John Archer
j-archer@sbcglobal.net

(all uncaptioned photos by Desiree Wong)

What do you like to do on vacation? I suspect that most reading this will have significantly different ideas of the ideal vacation itinerary than the average vacationer. I don't hear of too many acquaintances longing for a trip to Disney World or dreaming of an evening at a Parisian café. Not that both of those are poor choices. I've been fortunate to spend some time at Parisian cafés. I won't say my feelings toward my Disney visits (The kids loved them. Fortunately they're grown.) But my ideal vacation? Probably not going to be quite that civilized. Rustic living conditions in areas of the world that usually have fewer people than most vacation destinations seem to figure prominently in my desires. Yours too? Yeah, I thought so, and we know why: that's where the animals are. Particularly reptiles and amphibians. Many of us spend our weekends in terrain shunned by the majority of the population. Our ultimate vacation would most likely take that to extremes.

Cindy Steinle at the podium introduces Desiree Wong. Photograph by Barbara Nieri Hood.

The Shedd Aquarium here in Chicago has the best displays of reptiles and amphibians in the city. That should shame our two zoos, but they still don't seem interested in featuring in-depth collections of herps. The Shedd also is one of the leading organizations in the conservation of Caribbean rock iguanas, an effort headed by Dr. Charles Knapp. Dr. Knapp runs periodic trips down to the Bahamas to study the lizards. He has been the recipient of multiple CHS grants, and has been the featured speaker at several of our meetings, most recently in 2010 (Bull. Chicago Herp. Soc. 45(3):47-49). He believes in the value of citizens cooperating in research, so his excursions aboard the Shedd's research vessel *Coral Reef II* include nonscientists who apply through the aquarium.

I suspect that readers recognize the perils that many animals are facing. If you don't, you're not reading the *Bulletin* (or anything) enough. We are an organization dedicated to conserving all animals, especially reptiles and amphibians and toward that end your society supports conservation efforts with grants for academic studies and donations to organizations actively involved in conservation efforts. Many of you probably individually donate to the same causes. Because we care. We try to tread lightly and limit our impact on the world.

I happen to enjoy vacation slide shows. I enjoy them much more when I'm in charge of the speed of the slide show, but I rarely get bored when the speaker is enthusiastically relating their experiences. Maybe I'm just lucky enough to have interesting friends, because that doesn't seem to be the typical response to sitting through pictures of someone else's adventure.

Citizen science has been a recurring theme for CHS presenters in the past few years with multiple examples of ways that average citizens (and average herpers) can contribute to scientific inquiries.

You're wondering where this is going. Our August speaker's talk could have been titled, "What I Did on My Summer Vacation." Her idea of a great vacation had all the elements mentioned above with lots of pictures, enthusiasm, recruiting, and results.

Desiree Wong is a hobbyist, but she's contributed more than most to the herp world. An early trip to Grand Cayman sparked an interest in blue iguanas (*Cyclura lewisi*) and she became deeply involved with conservation by working with the International Reptile Conservation Foundation (IRCF). She's well known from all her appearances representing that organization at reptile trade shows and symposiums. She's been a frequent exhibitor at ReptileFest in that capacity. Desiree has taken a break from the IRCF, but she still is deeply concerned with conservation, particularly of iguanas. She isn't the type of person to sit around on a beach reading a novel during two weeks of vacation, so she cruised as a citizen assistant with Dr. Knapp to the islands of Andros in the Bahamas. Then visited Chicago to tell us about her trip.

The Bahamas lie just to the east of Florida. The island of Bimini lies about 60 miles east of Miami and Andros lies about 140 east. Andros is the largest of the Bahamian Islands and features the Andros Island iguanas (*Cyclura cychlura cychlura*), Chuck

Knapp's favorite. Desiree mentioned that she was prepared to argue for the blue iguanas, but became a convert when she saw the Andros iguanas. Her opening slide was a gorgeous headshot of one of these lizards. One of the largest and most colorful of the rock iguanas, the Andros Island iguana is unique in laying its eggs in termite mounds, a fact discovered by Dr. Knapp.

The photos came fast and furious as Desiree related her tale. Pictures of the Shedd's research vessel at dock and leaving the dock came on screen along with shots of its interiors, all of which looked pretty comfortable. "We even had a chef!" The cruise to Andros included a stop in Bimini to clear customs and we saw pictures, including one of a pay phone that looked operative, a rare sight indeed. The photos left Bimini and took us to Andros and we saw pelicans and fishermen and sharks swimming past. Large and colorful spiders filled our eyes along with a shot of a green plastic pumpkin on a porch. Desiree was gradually sinking us into a Bahamian state of mind.

We dived into the research with shots of lizards doing lizard stuff and the human participants capturing the lizards, taking blood, holding animals and getting stuck in the mud. Desiree said they were warned to avoid the mud but sometimes that wasn't heeded, usually at the cost of some struggling to remove oneself from the predicament. Flowering plants lent their beauty to her presentation, along with pictures of the ubiquitous poisonwood, which Desiree compared to poison oak. People measured animals and inserted pit tags. Sunset shots were gorgeous, birds abounded and curly-tailed lizards (*Leiocephalus* sp.) were everywhere. But lest we get too complacent, Desiree included

pictures of a hunters' camp with its accompanying debris and iguana skeletons. Fortunately Chuck Knapp's work has helped persuade the Bahamian government to make much of the iguanas' range a national park, but poaching continues.

The less-than-glamorous side of iguana research was illustrated with photos of tick removal from the lizards. A gory little picture of an unfortunate thumb was proof that not only can the iguanas bite, they can bite hard and painfully. And a bloody picture of Desiree's leg showed that she was not immune to the scraps and tears one may encounter on an island of sharp rocks and thorny shrubs.

But she didn't linger on the down side of her experiences. We saw terrific underwater shots taken of dazzling fish in crystal clear water and a cute iguana that may have been the smallest the researchers had ever captured. As expected, more than one person had their picture taken with the diminutive creature.

Desiree showed close to 400 slides and with her continuing dialogue allowed us a glimpse of what it's like to be a citizen scientist cooperating with Shedd researchers in the Bahamas. She stressed that she was an active and valuable participant contributing to real science. But she also showed us what fun the ten days were, flashing pictures of friendly cohorts and crew and talking about engaging interactions with the locals. She spent her summer vacation doing something fun, interesting and important. She encourages everyone who has an opportunity to replicate her experiences with citizen science. I liked her vacation photos. Hiking the beach looking for lizards definitely beats lying around getting sunburned. And it blows away Disney World.

Herpetology 2013

In this column the editorial staff presents short abstracts of herpetological articles we have found of interest. This is not an attempt to summarize all of the research papers being published; it is an attempt to increase the reader's awareness of what herpetologists have been doing and publishing. The editor assumes full responsibility for any errors or misleading statements.

TUATARA NESTING BEHAVIOR

J. M. Refsnider et al. [2013, Herpetologica 69(3):282-290] note that the costs of nesting to female animals can be substantial, and may dictate patterns of nest-site choice. In particular, females that travel farther to nest likely incur greater energetic costs and may be at greater risk of losing territories to conspecific competitors. The authors examined patterns of nesting migrations for a population of tuatara on Stephens Island, New Zealand, over 5 yr. Only about 7% of female tuatara observed nesting in a rookery also lived in that rookery. Of 140 females for which both residence and nesting locations were known, 42% traveled to a nesting rookery from their residential area. The average distance traveled by these females was 84 m, and travel was toward the rookery closest to a female's residence area. The results demonstrate that female tuatara on Stephens Island minimize the distance traveled on nesting migrations. The authors suggest that the patterns in nesting travel we observed in this population may be due to natal philopatry of nesting females, or to females minimizing the costs of nesting-related travel.

URBAN CASE STUDY OF TEXAS HORNED LIZARDS

A. J. Wolf et al. [2013, Herpetologica 69(3):265-281] note that disturbance caused by habitat restoration or urbanization can threaten populations of sensitive wildlife species. They examined the effects of habitat disturbance on the ecology of an urban population of Texas horned lizards (*Phrynosoma cornutum*), a species of concern in several states as a result of range-wide declines. The study quantified changes in spatial distribution, survival rates, and population size and density over 9 yr (2003–2011) for a *P. cornutum* population on an urban reserve. The project was divided into three, 3-yr stages based on level of habitat disturbance. Spatial analyses did not support the hypothesis that disturbance associated with restoration activities affected the spatial ecology of *P. cornutum* on the study site. However, these results were not conclusive due to the logistical constraints of working on a single site with an uncommon species. Survival (n = 147 lizards) was affected by season (inactive-season survival was higher), stage (declining survival in later stages with more disturbance), an interaction of season and stage, and disturbance (covariate of proportion of an individual's home range in disturbed areas for a given year). Major causes of mortality included predation and anthropogenic activity. Population size was estimated at 33 ± 5 individuals (excluding hatchlings) with a corresponding density of 2.68 lizards/ha in 2011, a 38% decline since 2005. This decline was likely a consequence of two factors: the 2008 translocation of 17 adult lizards from an area adjacent to the study site impacted by development and a decrease in the annual survival rate of adults over time. This case study addressed recent calls to examine specific mechanisms by which habitat loss and degradation affect herpetofauna and revealed classic responses of an isolated population to stochastic events and anthropogenic activities.

TURTLES IN BUSHMEAT MARKETS

L. Luiselli et al. [2013, Herpetozoa 26(1/2):57-64] note that the moist forests in the Niger Delta (southern Nigeria) are part of the West African forests biodiversity hotspot; they house a rich chelonian diversity, now threatened by deforestation, oil spills, and human consumption. Field surveys in nine bushmeat markets in the years 1996–2002 are compared with surveys in the same markets in 2011–2012, in order to perceive potential differences and similarities in the trends of local people's exploitation of terrestrial and freshwater chelonians. The number of traded chelonians significantly decreased, with two species (*Trionyx triunguis* and *Cyclanorbis elegans*) having fully disappeared from the market and two others (*Kinixys homeana* and *Kinixys erosa*) having almost disappeared. On the other hand, several chelonian carcasses were observed in 2012 in the market of Lomé, Togo. Interviews with local hunters revealed that demand for turtle meat did not change considerably in the last ten years, compared to other wildlife meat, and that tortoises are more difficult to encounter in the field than was the case in the previous decade. These findings suggest that the collapse of chelonian supply in bushmeat markets may be due to an overall, strong decline in abundance of these animals, and in particular, of tortoises of the genus *Kinixys*. Direct comparison of current trends with 10-year-old datasets urge immediate demographic research to evaluate the current level of population reduction for these wild tortoise populations in this part of Africa.

ALLIGATOR SNAPPING TURTLE CONSERVATION

T. C. Lescher et al. [2013, Chelonian Conservation and Biology 12(1):163-168] in 2009 resampled, at the same trapping locations, six sites that had been sampled for alligator snapping turtles (*Macrochelys temminckii*) in 1993–1994. Significantly fewer alligator snapping turtles were captured per trap night at all six sites, and the population structure of the alligator snapping turtles had a significantly different distribution in 2009 compared with 1993–1994. In order to continue monitoring their long-term trends in relative abundance and population structure, future sampling of alligator snapping turtles at these six sites is recommended.

HABITAT FOR YANGTZE GIANT SOFTSHELLS

Wang Jian et al. [2013, Chelonian Conservation and Biology 12(1):177-184] carried out exhaustive interview surveys on the upper Red River (Honghe) and nearby river systems of southwest China to characterize the distribution of *Rafetus swinhoei*, one of the world's rarest turtles. Results show that it once ranged strictly in the Red River system, apart from the lower Yangtze, and still existed in recent years, although on the brink of extinction due to overharvesting and habitat degradation. Further conservation efforts require monitoring of hunting and trade of turtles in this region, public education, delaying the building of dams, setting up new protected areas, and international cooperation.

BLUE-SPOTTED SALAMANDER HABITAT SELECTION

A. Belasen et al. [2013, Copeia 2013(2):254-261] note that elucidating the mechanisms that influence spatial distribution patterns is vital to understanding how populations persist. They examined distribution in one of the most common salamanders in southeastern Michigan, the blue-spotted salamander (*Ambystoma laterale-jeffersonianum* unisexual complex). Three major tree species dominate the sub-canopy in the study site and form monospecific patches, which may have an effect on the distribution of terrestrial phases of local amphibian species. To examine this, the authors tested whether adult salamanders are significantly associated negatively or positively with patches of particular tree species. They then examined two potential causal factors: habitat quality, using leaf litter macroinvertebrate biomass as a proxy, and behavioral site choice in the blue-spotted salamander. They found that this species is positively associated with patches of red maple and negatively associated with patches of black cherry. They also found that, when presented with a choice, salamanders choose red maple leaf litter over black cherry leaf litter. In the absence of differences in physical leaf litter characteristics between patches of red maple and black cherry, they suggest that the salamanders may be utilizing chemical cues to select habitat. These findings imply that salamander populations may be affected not only by habitat loss, but also by changes in forest composition. These results provide evidence for a more complex model than the traditional amphibian metapopulation concept, where even fully forested habitat may form a matrix of optimal and suboptimal, or even intolerable, patches.

GIANT TORTOISES OF THE SEYCHELLES

J. Gerlach et al. [2013, Chelonian Conservation and Biology 12(1):70-83] note that the giant tortoises (*Aldabrachelys* or *Dipsochelys*) of the Indian Ocean islands have been in decline since the first human settlement of the islands. They retain only a single natural population on Aldabra Atoll (and possibly Ile aux Cerfs, where tortoises are descendants of a mixture of indigenous and imported animals). Several additional wild populations are known, resulting from reintroductions to the historic range and introductions outside of that range. The historical distribution of tortoises in Seychelles is summarized, with reliable tortoise records from only 4 coralline islands and 23 granitic islands and the status of all the wild populations reviewed. This includes the first census of the Frégate Island population. In the granitic islands, only 9 islands support tortoises today and the wild population of these islands is estimated at 500–550 adults. In the coralline islands, tortoises are now present on 11 islands, with a total population of over 100,000 (almost all on Aldabra). Climate change impacts over the next 100 yrs are expected to be severe in low-lying areas of the Seychelles Islands attributable to sea-level rise and storm impacts on coastal erosion. These are projected to result in the loss of many populations and significant declines in the Aldabra population. As a result, the species should be regarded as Vulnerable by IUCN Red List Threat Criteria. Reintroduction to more of the high granitic islands could offset some of these projected declines, and it is recommended that such reintroductions be included in future conservation programs to restore ecosystem function.

ANCIENT PHENOTYPES REVEALED

D. Fielder [2013, Chelonian Conservation and Biology 12(1): 101-111] note that understanding of evolutionary history and speciation events to inform phylogeography of extant species can be gleaned from the fossil record. However, the fossil record for Australian freshwater turtles contains many gaps and interpretation of the fossils that are known is difficult because of poor knowledge of the morphology of extant forms. There are no fossils currently assigned to short-necked turtles in the genus *Myuchelys*. In an alternative approach, morphological characters of the extant species *Myuchelys bellii*, *M. georgesi*, *M. latisternum*, and *M. purvisi* were mapped against their current molecular phylogeny. The cryptic species pair, *M. georgesi* and *M. purvisi*, are morphologically very similar, but distant phylogenetically, and their common ancestor includes *M. latisternum* and *M. bellii* in its decendents. This suggests that current shared morphology of *M. georgesi* and *M. purvisi* represents a suite of symplesiomorphies (shared primitive characters). These characters include presence of a cervical scute, lack of prominent neck tubercles, a relatively small head size, minor or no serrations of marginal scutes, an oval carapace, and a smooth head shield extending down the parietal arch toward the tympanum. This commonality of characters of this cryptic species pair represents a rare insight to the ancestral phenotype of the *Myuchelys*. The loss of the cervical scute and presence of enlarged neck tubercles, a large robust head and furrowed head shield, deep serrated shell margins, and compressed shell profile in *M. bellii* and *M. latisternum* are synapomorphies (shared derived characters). There is no morphological support for the distinction at the level of species or subspecies between discrete populations of *M. bellii*. A dichotomous key to species is provided.

MANAGEMENT OF AMAZON RIVER TURTLES

P. S. Miorando et al. [2013, Chelonian Conservation and Biology 12(1):143-150] note that *Podocnemis sextuberculata* is cited as "vulnerable" on the International Union for Conservation of Nature Red List due to a decline in its population as a result of the intensive exploitation pressure throughout its range. Understanding the effects of environmental characteristics and human activities on turtle populations is essential to improve current conservation programs. The authors analyzed the abundance of *Podocnemis sextuberculata* in the lower Amazon, where a management experiment is under way, by comparing neighboring areas with and without community-based management (CBM) initiatives. In addition, they analyzed the influence of environmental variables on the species' abundance. Abundance was measured by captures per unit effort expressed in number of individuals ($CPUE_N$) and biomass ($CPUE_B$). The effects of CBM and environmental variables were tested by General Linear Model analysis. A total of 354 individuals were captured, 321 in the areas under CBM and 33 in areas without CBM. $CPUE_N$ and $CPUE_B$ were strongly correlated, and their values were about 10-fold higher in the areas carrying out CBM initiatives. The variable that best explained variation in $CPUE_N$ and $CPUE_B$ was CBM. Distance between the sampling point and the nearest nesting beach and river level also influenced capture rates. Results clearly show that local fishing restrictions can have a positive influence on turtle populations.

Unofficial Minutes of the CHS Board Meeting, August 16, 2013

The meeting was called to order at 7:36 P.M. at the Schaumburg Public Library. Board members Josh Baity, Jim Foster, Aaron La Forge and Cindy Rampacek were absent.

Officers' Reports

Recording Secretary: The minutes of the July 19 board meeting were read, discussed and accepted.

Treasurer: The July financial report was discussed and accepted.

Membership Secretary: Numbers are holding at just under 500. The list of expiring memberships was read.

Sergeant-at-arms: July meeting attendance was 64.

Committee Reports

Shows:
- Notebaert Nature Museum, first full weekend of each month.
- Red Oak Nature Center, Bug Fest, August 24.
- Notebaert Nature Museum Trivia Night, 6–9 P.M., August 27.
- Unity Fest, Marquette Park, 10 A.M.–3 P.M., September 7.
- Meet the Creek, Kiwanis Park, Brookfield, 12:30–4 P.M., September 14.
- Blessing of the Animals, Pullman, Noon, October 6.
- NARBC, Tinley Park, October 12–13.

Old Business

Herps of Illinois: Jason will forward guidelines written by Erica Mede for the board to look through before the next meeting.

Junior Herpers: Had a great meeting in August! Barbara Nieri Hood has been working on the website. Dan Bavirsha will speak in September.

Nominating Committee: Jason appointed Mike Scott as chair of the committee. Other members are Linda Malawy, Mike Dloogatch, Rich Lamzsus and Dave Hoff

New Business

Awards Committee: The 2013 Awards Committee needs to begin their considerations.

Magazine Sales: Herp Nation is offering their magazines to societies at a reduced rate to be sold as a fundraiser at meetings. We will not take part at this time.

Canadian Rock Python News story: A discussion took place regarding whether the Society should release a statement or opinion about this situation. A statement released by USArk and others was discussed, and will be placed on our website.

Treasurer: Should we have tighter control over our treasury in light of problems experienced by other societies? Andy will research our options.

Round Table

Bob Bavirsha still has snapping turtles hatching from eggs he rescued which are being incubated at a nature center and then released.

Nancy Kloskowski lost her Amazon parrot recently after having had it as a pet for 43 years.

Jason Hood had Amazon tree boas born, some of which had trouble. He successfully used CPR to resuscitate one.

The meeting was adjourned at 9:40 P.M.

Respectfully submitted by Jenny Vollman

Advertisements

For sale: rats and mice—pinkies, fuzzies and adults. Quantity discounts. Please send a SASE for pricelist or call Bill Brant, *THE GOURMET RODENT*, PO Box 430, Newberry, FL 32669-0430, 352-472-9189, E-mail: GrmtRodent@aol.com.

For sale: **highest quality frozen rodents**. I have been raising rodents for over 30 years and can supply you with the highest quality mice available in the U.S. These are always exceptionally clean and healthy with no urine odor or mixed in bedding. I feed these to my own reptile collection exclusively and so make sure they are the best available. All rodents are produced from my personal breeding colony and are fed exceptional high protein, low fat rodent diets; no dog food is ever used. Additionally, all mice are flash frozen and are separate in the bag, not frozen together. I also have ultra low shipping prices to most areas of the U.S. and can beat others shipping prices considerably. I specialize in the smaller mice sizes and currently have the following four sizes available: Small pink mice (1 day old—1 gm) , $25 /100; Large pink mice (4 to 5 days old—2 to 3 gm), $27.50 /100; Small fuzzy mice (7 to 8 days old—5 to 6 gm) , $30/100; Large fuzzy mice / hoppers (10 to 12 days old—8 to 10 gm), $35/100 Contact Kelly Haller at 785-234-3358 or by e-mail at kelhal56@hotmail.com

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Line ads in this publication are run free for CHS members—$2 per line for nonmembers. Any ad may be refused at the discretion of the Editor. Submit ads to mdloogatch@chicagoherp.org.

UPCOMING MEETINGS

The next meeting of the Chicago Herpetological Society will be held at 7:30 P.M., Wednesday, September 25, at the Peggy Notebaert Nature Museum, Cannon Drive and Fullerton Parkway, in Chicago. **Justin Julander**, research associate professor in the Institute for Antiviral Research at Utah State University, will speak on "Natural History of Australian Pythons and Implications for Captive Care." Justin is also co-owner of Australian Addiction Reptiles and has been keeping and breeding Australian reptiles for the past 16 years. The pythons of Australia are a diverse group of ambush predators that are adapted to life in a variety of habitats. While the many species share several key features, various taxa are also specifically adapted to fill certain niches. Such behavior and adaptive traits in the wild are quite fascinating and recent studies have provided important insights into the natural history of these snakes. There are also implications on captive care that will help keepers improve conditions for their maintenance in an artificial environment.

At the October 30 meeting, our speaker will be **Jennifer Stabile**, amphibian conservation coordinator and senior keeper at the Albuquerque BioPark Zoo.

The regular monthly meetings of the Chicago Herpetological Society take place at Chicago's newest museum—the **Peggy Notebaert Nature Museum**. This beautiful building is at Fullerton Parkway and Cannon Drive, directly across Fullerton from the Lincoln Park Zoo. Meetings are held the last Wednesday of each month, from 7:30 P.M. through 9:30 P.M. Parking is free on Cannon Drive. A plethora of CTA buses stop nearby. Free parking is available in the walled-in area to the south of the loading dock ramp.

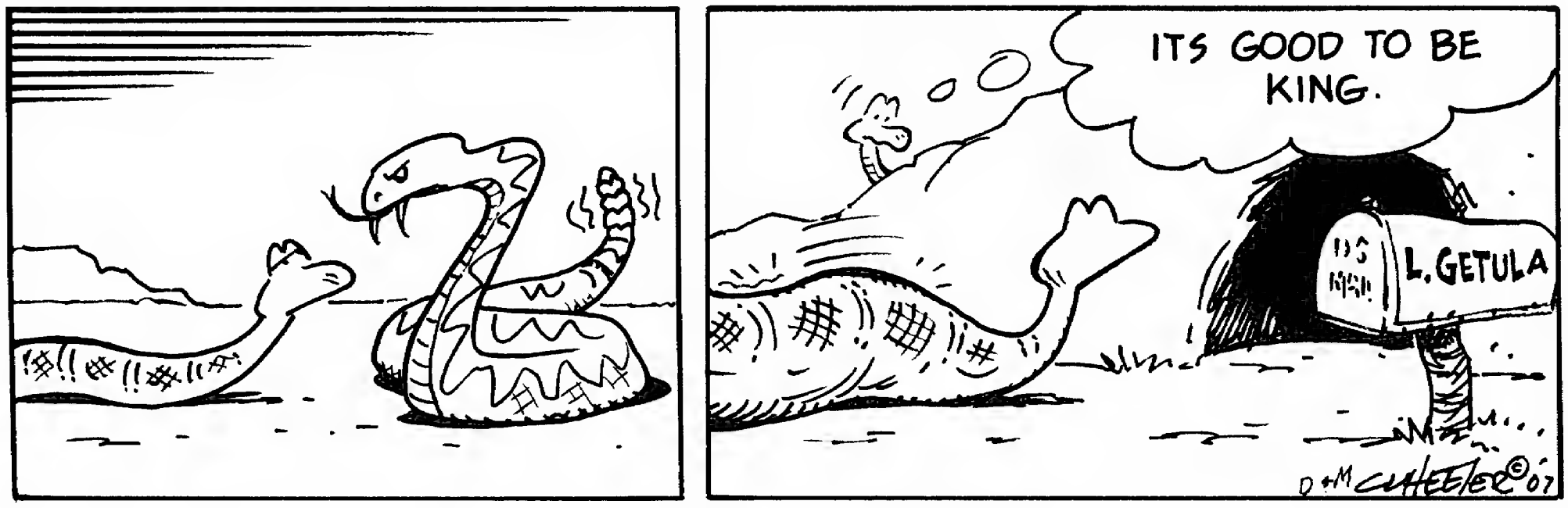
Board of Directors Meeting

Are you interested in how the decisions are made that determine how the Chicago Herpetological Society runs? And would you like to have input into those decisions? If so, mark your calendar for the next board meeting, to be held at 7:30 P.M., October 18, in the adult meeting room on the second floor of the Schaumburg Township District Library, 130 S. Roselle Road, Schaumburg..

The Chicago Turtle Club

The monthly meetings of the Chicago Turtle Club are informal; questions, children and animals are welcome. Meetings normally take place at the North Park Village Nature Center, 5801 N. Pulaski, in Chicago. Parking is free. For more info visit the group's Facebook page.

THE ADVENTURES OF SPOT



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BULLETIN
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October 2013

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Additional Cases of Snakes Entrapped in Garden Netting: *Pantherophis vulpinus* and *Crotalus horridus* in Southeastern Minnesota . . . . . Philip A. Cochran 129

An Addition to Geckos of the Genus *Hemidactylus* Oken 1817 in Pakistan, with Notes on Morphology, Ecology and Distribution of Species . . . . . Muhammad Sharif Khan 130

Notes on the Herpetofauna of Western Mexico 11: A Range Extension for the Mexican Dusky Rattlesnake, *Crotalus triseriatus*, in Jalisco, Mexico . . . . . Daniel Cruz-Sáenz, Erika Sugey García Mata and David Lazcano 135

The Tympanum . . . . . Ray Pawley 136

Frog City: X. House Music . . . . . Ilene Sievert 137

Unofficial Minutes of the CHS Board Meeting, September 13, 2013 138

Advertisements 139

News and Announcements: 2014 CHS Herpetological Grants Program 140

Cover: Eastern box turtle, *Terrapene carolina carolina*, Johnson County, Illinois. Photograph by Stephen L. Barten, D.V.M.

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Additional Cases of Snakes Entrapped in Garden Netting: *Pantherophis vulpinus* and *Crotalus horridus* in Southeastern Minnesota

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A recent article in this journal has detailed the risk to snakes posed by plastic mesh garden netting of the sort used to protect plants from deer or other pests (Barker, 2013). The cases described by Barker (2013) involved snakes living in Texas. During the course of my service as a rattlesnake responder in Winona County, Minnesota, I have encountered snakes of two additional species that were severely entangled in garden netting.

1. Western fox snake: At 09:15 on 11 May 2012, I responded to a call from a landowner in southern Winona County about a dead "timber rattlesnake" with its head caught in some garden netting. The snake proved to be a large western fox snake (total length: 1387 mm). I did not record the mesh size or whether the netting was anchored as described by Barker (2013), but it was difficult to extract the snake from the netting.

2. Timber rattlesnake: At 15:00 on 12 September 2013, I responded to a call from a Winona landowner about a timber rattlesnake entangled in garden mesh netting that he said was used as a barrier to deer. The netting was made of fine black plastic with rectangular mesh openings measuring $^5/_8 \times {}^3/_4$ inch (17 × 19 mm) but a stretch mesh of 1.31 inch (33 mm). Note that this was smaller than the 1-inch (25.4-mm) square mesh described by Barker (2013). The netting was anchored at its lower edge. The rattlesnake (total length: 789 mm, mass: 0.3 kg) was first noticed by the landowner at approximately 12:00. By the time I was called, the anterior third of its body was almost completely immobilized, its head and mouth were severely distorted, and its body was constricted in several places. The snake was still able to rattle while I cut the tangle of mesh that surrounded it from the netting around it. I returned with the snake to my home where I carefully removed the netting from around its body. It was necessary to use a small scissors to cut individual strands tightly pressed against its head and body. Once the netting was removed, the snake recovered its normal shape. Many scales appeared to be loosened and lifted away from the body surface (Figure 1), but there were few breaks in the skin. These were treated with an antibiotic ointment before the snake was released.

I am aware of another timber rattlesnake from Winona that was found entangled in deer netting. The snake (total length: 1094 mm, mass: 1.0 kg) was given to me for processing by the conservation officer who removed it from the fence on the morning of 11 August 2008, but because he mentioned the fencing only briefly in passing and I noticed no obvious marks on the snake, I did not have the impression that it was a severe case, and I did not collect descriptive information about the netting.

The observations reported herein add weight to Barker's (2013) report of the risks of garden mesh netting for snakes. A possible substitute that may work for some applications may be hardware cloth. With its smaller mesh and rigid structure, it may be less likely to entangle snakes. Indeed, Brown (1993) reported its successful use to exclude timber rattlesnakes from the vicinity of tourist cabins in New York. Drawbacks include its greater cost in comparison to plastic mesh and the greater investment in labor to install it, but it may also be much more durable than plastic mesh. Or, there is another way:

> And it was a sad day, a few summers ago, when I found a large garter snake choked in a mesh fence I had put up to keep the deer out of the perennial garden. It was too late, but as I cut it out of the mesh I kept saying, "I'm sorry, I'm so sorry." I carried the lifeless body by the tail and left it down in the field for the crows and the turkey buzzards. I dismantled the fence, let the deer eat what they liked down to the ground, and then filled in the spaces with the things they didn't like. Godwin (2003)

Acknowledgments

I would like to thank the landowners who take advantage of the rattlesnake responder program. My neighbor Chuck Kernler provided assistance in the delicate process of removing netting from around the timber rattlesnake. My activity as a rattlesnake responder is authorized by a permit from the Minnesota Department of Natural Resources.

Figure 1. A timber rattlesnake after removal from plastic netting. The light areas on the anterior surface of the body resulted from scales lifted away from the body surface by embedded strands of netting.

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Bull. Chicago Herp. Soc. 48(10):130-134, 2013

An Addition to Geckos of the Genus *Hemidactylus* Oken 1817 in Pakistan, with Notes on Morphology, Ecology and Distribution of Species

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Introduction

The genus *Hemidactylus* is one of the most speciose, with over 122 species of worldwide circumtropic distribution (Uetz et al., 2013). Despite morphologically fairly uniform appearing taxa, recent mitochondrial DNA studies (Bauer et al., 2006; Carranza and Arnold, 2006, 2012) have demonstrated that they are genetically quite divergent, thus adding several new species. Khan (2006) listed seven species of the genus *Hemidactylus* in Pakistan: *H. brookii*, *H. flaviviridis*, *H. frenatus*, *H. leschenaultii*, *H. persicus*, *H. triedrus* and *H. turcicus*. However, recent DNA studies validated *H. robustus* Heyden 1927—long confused with *H. brookii* and *H. triedrus* in Iran and Pakistan—as a distinct species, thus adding an eighth *Hemidactylus* to the fauna of Pakistan (Bauer et al., 2006)).

Key to the Pakistani species of the genus *Hemidactylus*

1a. Dorsal tubercles round, few or absent; lamellae under fourth toe 14–15; belly yellowish----------*H. flaviviridis*
1b. Dorsal tubercles round, many, scattered; lamellae under fourth toe 14–15; belly dirty white----------*H. leschenaultii*

2a. Dorsal tubercles, round, subtrihedral, keeled, in regular rows---------- 3
2b. Dorsal tubercles absent or few; lamellae under fourth toe 9–11----------*H. frenatus*

3a. Dorsal tubercles in 14–19 rows; lamellae under fourth toe 6–10---------- *H. brookii*
3b. Dorsal tubercles in 13–16 rows---------- 4

4a. Lamellae under fourth toe 10–15; pre-cloacal pores 6–9 ----------*H. persicus*
4b. Number of lamellae under fourth toe less than above--------5

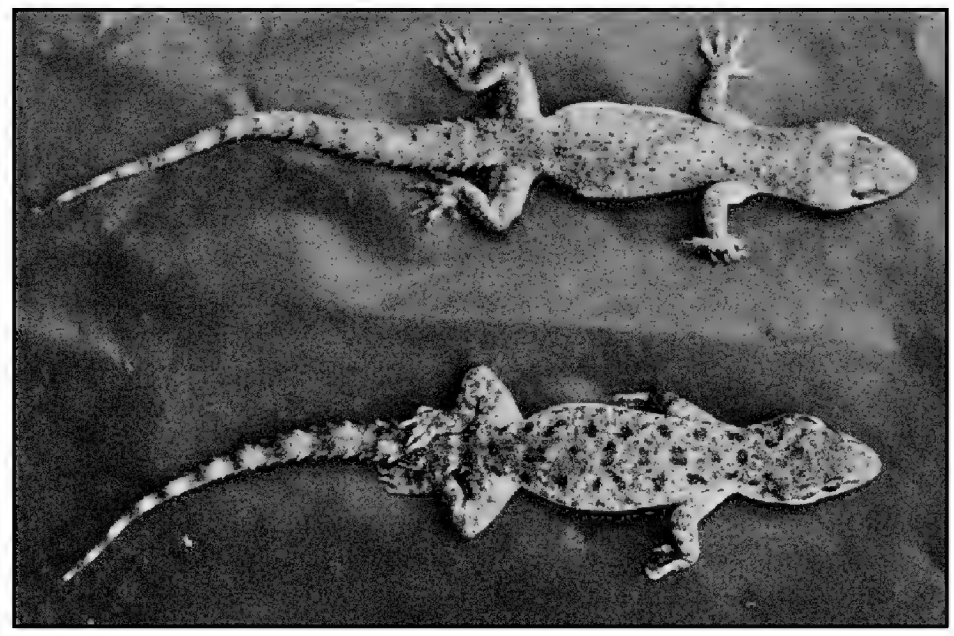
5a. Pre-cloacal femoral pores 24–30; lamellae under fourth toe 9–10---------- *H. triedrus*
5b. Number of pre-cloacal femoral pores much less----------6

6a. First 3–4 tail segments tuberculated; lamellae under fourth toe 8–11----------*H. robustus*
6b. Tail tuberculated throughout; 9–12 lamellae under fourth toe----------*H. turcicus*

Short descriptions of species

(For detailed scale counts see Table 1)

Hemidactylus brookii Gray, 1845—Spotted barn gecko



Type locality: Borneo, southeastern Asia.

Color: Metachromatic, changing between dark brown and light gray, with dark spots, and a stripe from eye to the temple.

Range: Common in the Indo-Pakistan subcontinent, Sri Lanka and most of Southeast Asia. Avoids higher mountains, found in the peripheral humid areas around deserts and oases. Khan and Tasnim (1990) report that in Rohtas Fort, Punjab, Pakistan, *Hemidactylus brookii* is sympatric with *Cyrtopodion montiumsalsorum*, *Indogekko rohtasforta*i, *Hemidactylus flaviviridis* and *Hemidactylus persicus*.

Hemidactylus flaviviridis Rüppell, 1835—Yellow-bellied gecko

Type locality: Massaua Islands, Eritrea, northeastern Africa.

Color: Metachromatic, individuals exposed to light are greenish-gray with five distinct dark wavy crossbars on the dorsum and tail. The barred pattern fades with age, and is faint or absent in individuals living inside buildings, which are a uniform grayish-white. Belly is always yellowish.

Range: Common house gecko, ranges widely throughout the Indo-Pakistan subcontinent. It extends to Red Sea along the

Table 1. Comparative morphology of the *Hemidactylus* species of Pakistan (+ = present; - = absent; all lengths in mm). Sources: Baha El Din (2005); Bauer et al. (2006); Carranza and Arnold (2012).

Character	***brookii***	***flaviviridis***	***frenatus***	***leschenaultii***	***persicus***	***triedrus***	***turcicus***	***robustus***
Snout–vent length	62–65	86–95	60–62	86–86	68–70	75–77	58–61	
Tail length	59–63	89–93	60–67	86–87	84–86	76–78	59–65	
Supralabials	8–10	12–15	10–12	10–12	10–12	8–10	7–10	8–11
Infralabials	7–9	10–14	8–10	8–10	8–10	7–8	6–9	7–9
Nasal / 1st labial in contact	+	+	+	+	+	-	+	
Dorsal tubercles Shape Arrangement	+ subtrihedral regular	very rare round irregular	few or absent round irregular	+ round, trihedral irregular	+ subtrihedral regular	+ subtrihedral regular	+ subtrihedral regular	+ round, keeled regular
Subdigital lamellae (4th toe)	6–10	12–15	9–10	9–11	11–15	7–10	9–15	8–11
Pores Precloacal Precloacal-femoral Medial separation	 6–9 - +	 - 8–15 -	 - 26–36 -	 - 10–17 +	 6–9 - -	 - 6–14 +	 2–10 - -	 6–7 - -
Tail Appearance Segmentation Tubercules	 subcylindrical distinct keeled, pointed	 strongly depressed indistinct conical	 subcylindrical indistinct pointed	 strongly depressed distinct pointed	 cylindrical distinct pointed	 subcylindrical indistinct keeled, pointed	 subcylindrical distinct pointed	 subcylindrical indistinct 1st 3–4 segments with a few pointed scales
Dorsal pattern	spotted	wavy crossbars	spots / stripes	crossbars	light & dark tubercles	saddles	spotted	mid-dorsum with oblique dark bars, lateral broken bars
Eye-to-temple stripe	+	-		+	+	+	+	
Ventral coloration	dirty white	yellow	white	dirty white	whitish	pale	dirty white	dirty white

coasts of Arabia and Iran, Pakistan, and India, Bangladesh, Sri Lanka and nearby islands, at elevations below 1000 m, always in association with human dwellings.

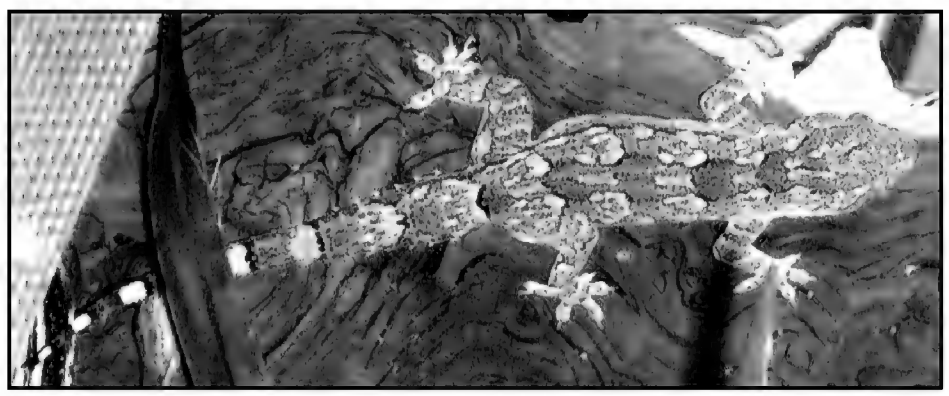
Hemidactylus frenatus Schlegel *in* Duméril and Bibron, 1836
Waif gecko

Type locality: Java, southeastern Asia.

Color: Dorsum grayish to pinkish, sometimes darker, with indistinct dark spots, sometimes arranged in stripes. The belly is white; tail sometimes red.

Range: A pantropic species; ranges from Japan, Polynesia, Australia, Asia, Africa, and the southern United States. In Pakistan it has a coastal distribution.

Hemidactylus leschenaultii Duméril and Bibron, 1836
Tree gecko

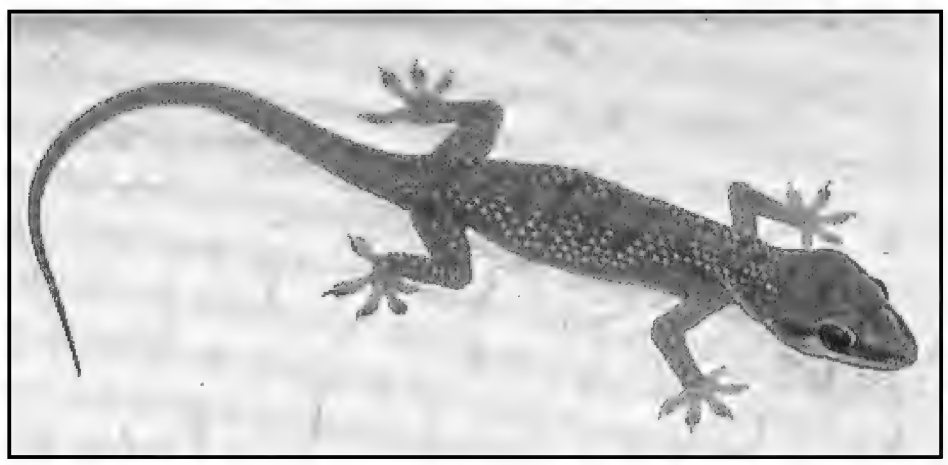


Type locality: Sri Lanka.

Color: Dorsum gray with dark brown crossbars or rhomboidal blotches. A dark streak from the eye to the flanks. Belly dirty white.

Range: From Assam (India), Bangladesh, eastern and southern India, along the western coast of India, and in Pakistan lower Sindh (including the lower Indus Delta), Las Bela and southern Balochistan regions, also reported from Oman.

Hemidactylus persicus Anderson, 1872—Persian gecko



Type locality: Shiraz, Persia.

Color: The dorsum is light brownish gray with irregularly scattered white, brown, or black spots, and rows of keeled tubercles. A dark stripe from the eye to the temporal region. The belly is whitish.

Range: From Saudi Arabia, southern Iran, and in Pakistan from Balochistan and Sindh northward to Waziristan. Recently it has also been reported in the southern Potohar Plateau, in central Punjab, Pakistan (Khan and Tasnim, 1990).

Hemidactylus robustus Heyden, 1827—Red Sea leaf-toed gecko

Type locality: Egypt, Arabia, Abyssinia

Color: Basic dorsal coloration pinkish brown, translucent. A series of dark spots arranged longitudinally along mid-dorsum, often indistinct. Tail with numerous irregular, narrow, dark bands.

Range: India, Pakistan, Egypt, Arabia, Ethiopia.

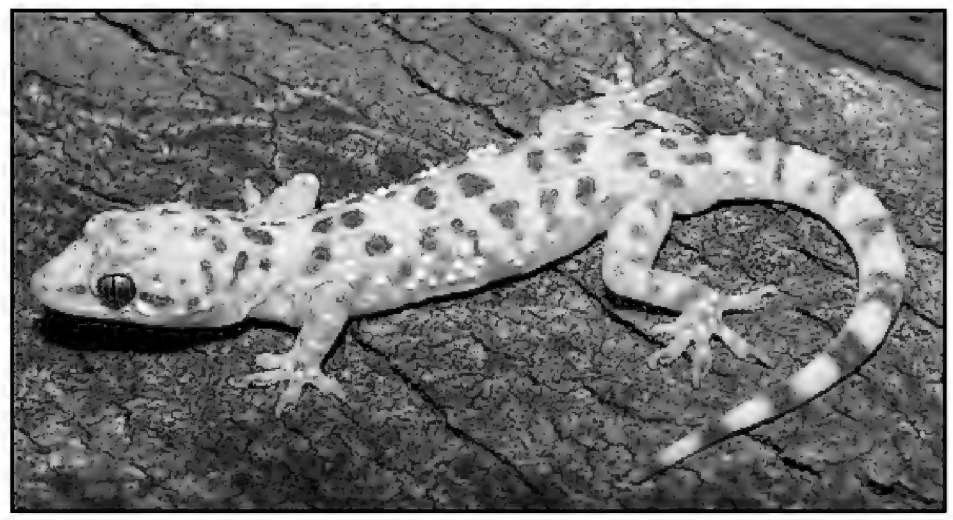
Hemidactylus triedrus (Daudin, 1802)—Blotched house gecko

Type locality: Unknown.

Color: Dorsum yellowish, with three large dark-brown saddles with narrow black borders; tail with dark rings. There are one or two yellow stripes behind the eye, and another on the nape. The belly is pale.

Range: From Sri Lanka through peninsular India to Karachi, Pakistan. It is known in coastal localities of the lower Indus Delta.

Hemidactylus turcicus (Linnaeus, 1758)—Mediterranean gecko



Type locality: Asian Turkey.

Color: The dorsum light brown, grayish, pale pink, or whitish, with black spots sometimes arranged in transverse rows. Tubercles in the spots are black; other tubercles are white. There is usually a dark streak from the eye. The belly is dirty white.

Range: Reported from West Indies, eastern Mexico, the southern United States, countries and islands around the Mediterranean, northern Africa, the Middle East, Iran, and Afghanistan. In Pakistan it has been reported in various coastal localities of Sindh. In the city of Karachi this gecko is found inside houses together with *Hemidactylus flaviviridis* (Minton, 1966).

Vocalization

Sound production is well known phenomenon within the family Gekkonidae (Marcellini, 1978; Böhme et al., 1985; Greer, 1989). As in other vertebrates sound production in geckos is associated with laryngeal specialization (Russell et al., 2000).

According to my observations geckos of the genus *Hemidactylus* and related genera vocalize on two occasions:

- When in distress or being handled, the gecko (male or female) struggles to be freed, emitting 2–3 short, faint, sharp squeaks, threatens with wide open mouth and voids excrement in a normal reflex (*Hemidactylus*, *Siwaligekko*, *Indogekko* and *Cyrtopodion*).
- A sexually active male gives a series of "such, such, suck" or "skhh, skhh, skhh, skhh," calls while courting and marking the territory (Khan, 2006).

However, contrary to the my observations over the past 40 years, birdlike chirping that could be heard at a distance of about 50 feet has been reported in *H. flaviviridis* (Mahendra, 1936; Minton, 1966). Parshad (1916) made no mention of vocalization in *H. flaviviridis*. Indraneil Das (personal communication, 2004) has never heard "chirping" in this species as described.

Technically a chirp is a short, sharp note, especially one produced by a bird or insect. Insects chirp by rubbing a sharp ridge on one wing against a series of wrinkles or "files" on the other. The pitch of the chirp depends on the distance between the wrinkles. However, a bird's chirp is produced in a special organ, the syrinx, located deep in the bird's neck, close to its lungs. High and low pitched notes are produced with opened or closed beak. In geckos the sound-producing organ is the larynx, located in the throat. High-pitched distress calls are uttered with the mouth open, low pitched grunts with the mouth closed.

In my opinion reports of chirping by *H. flaviviridis* most probably stem from occasions when a hidden house cricket (*Acheta domestica*) chirps and a hidden gecko is close by. Both creatures are active during summer, and hide under household articles. The insect's chirps are taken as that of the gecko.

Similarly, Anderson (1999: 153) records "whit-whit" calls from a place where he had earlier seen a gecko *Cyrtodactylus* (now *Cyrtopodion*) *agamuroides*, and attributes the calls to the lizard; he also attributes "tsh, tsh" notes to the geckos *Cyrtodactylus* (now *Tenuidactylus*) *sagittifer*. However, he never observed the lizards making these calls (personal communication, 2004). While in field in deserts of Pakistan, I myself have heard small thrushlike birds making "whit, whit" and "tsh, tsh" calls during evenings, in high grass areas!

M. L. Golubev used gecko calls to distinguish species of genus *Mediodactylus* from those of the genus *Tenuidactylus* (personal communication, June, 2004). Minton (1966: 87) describes the call of *Hemidactylus frenatus as* "a series of four or five loud, staccato notes similar to the sound of a coin tapped against a window pane," and that of *H. triedrus* as "a spitting sound" (page 85). Gallagher and Arnold (1988) described *H. turcicus* calling in short barks.

However, the loud "chuck-chuck-chuck" call attributed to *Hemidactylus brookii* by Daniel (1983) needs comment. A loud "chuck-chuck-chuck" call is characteristic of the common skittering pond frog, *Euphlyctis cyanophlyctis*. This frog may call from ponds and puddles during warm evenings in the subcontinent (Khan, 2006). The frog and *H. brookii* share such wetland habitats. The frog's calls are wrongly attributed to *H. brookii*, since no call is recorded for this gecko, except for the distress call reported above (Khan, 2006).

Persecution

In Pakistan geckos are not welcomed in houses. This is so despite the fact that they are beneficial to humans, in that they help to control common harmful insect pests, such as crickets, flies, ants, grasshoppers, etc. It is commonly believed that gecko skin carries germs that may harm humans. It is also thought that food may be poisoned if a gecko or its feces drop into it. Periodic house-cleanings regularly involve killing of geckos. The lizard's greatest offense—due to which it is widely killed—stems from a story that it punctured the goatskin bag in which water was being carried during the Battle of Karbala (Iraq) during early Muslim history.

Moreover, geckos fall prey to a variety of predators: scorpions, birds, lizards, snakes, frogs, other geckos, etc. Despite human wrath and high predation geckos are strongly holding on in human habitations.

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Bull. Chicago Herp. Soc. 48(10):135-136, 2013

Notes on the Herpetofauna of Western Mexico 11: A Range Extension for the Mexican Dusky Rattlesnake, *Crotalus triseriatus*, in Jalisco, Mexico

Daniel Cruz-Sáenz [1], Erika Sugey García Mata [2] and David Lazcano [3]

Abstract

Crotalus triseriatus, a species whose distribution is restricted to the southern mountainous areas in the state of Jalisco, was found in the protected natural area "Bosque La Primavera," located next to the Guadalajara metropolitan area, at a lower elevation than previously reported in the literature.

Resumen

Crotalus triseriatus una especie cuya distribución se restringe a las zonas serranas del sur del estado de Jalisco, fue encontrada en el área natural protegida "Bosque La Primavera" que se encuentra próximo a la zona metropolitana de Guadalajara a una elevación menor a la reportada en la literatura.

Introduction

The *Crotalus triseriatus* species group of montane rattlesnakes is distributed from the southwestern United States to the Neovolcanic Belt in central Mexico (Bryson et al., 2010). These relatively small-bodied montane rattlesnakes inhabit the pine-oak forests of Mexico (Campbell and Lamar, 2004).

C. triseriatus is present in the Mexican states of Jalisco, Colima, Estado de México, Distrito Federal, and Morelos (Armstrong and Murphy, 1979). In the highlands of the Neovolcanic Belt *C. triseriatus* is found at altitudes of 2,500 to 4,572 m (Campbell and Lamar, 1989; 2004). This species is found in temperate forest, usually pine vegetation (Klauber, 1956)

Study site

The protected natural area "Bosque La Primavera" (Área de Protección de Flora y Fauna la Primavera) is adjacent to the metropolitan area of Guadalajara (Figure 1). The main vegetation type is oak forest.

Results

There are several records of *C. triseriatus* outside the volcanic belt at elevations above 2000 m (e.g., Tapalpa municipality: Rancho San Francisco, 1.5 km of Tapalpa 2103 m [Campbell, 1979]). We report this species for first time in the natural protected area, but the most interesting aspect of this record is the low elevation, 1552 m. The main vegetation type is oak forest and pine-oak forest. The specimen was relocated because it was found in an area frequented by tourists.

Figure 2. Mexican dusky rattlesnake, *Crotalus triseriatus*, as found on 19 August 2008 in the area of Río Caliente in the protected natural area "Bosque La Primavera."

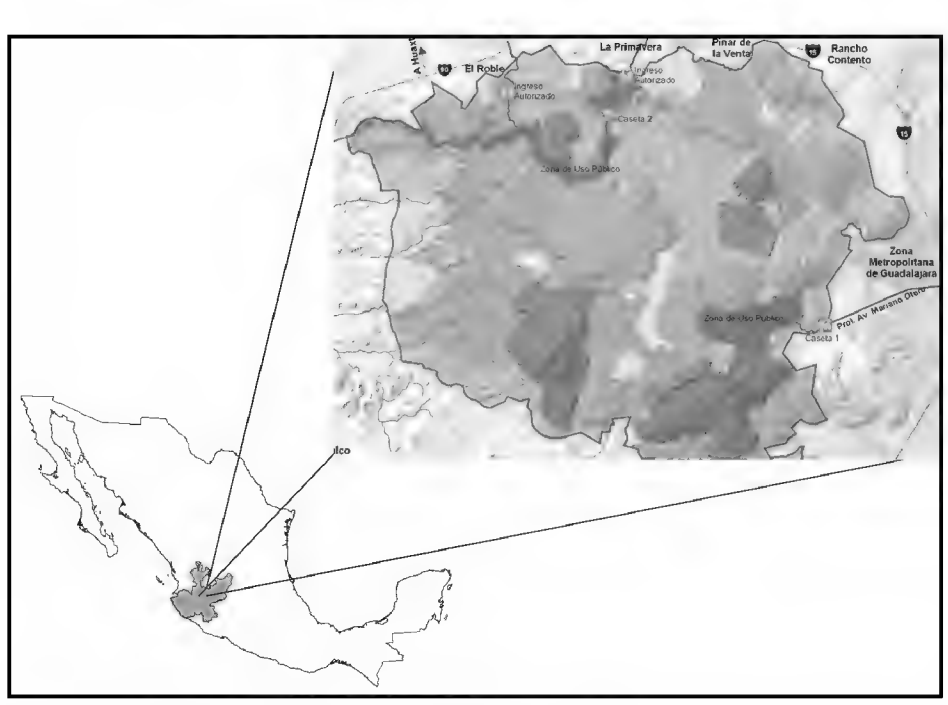

Figure 1. Location of "Bosque La Primavera."

Figure 3. Río Caliente, the thermal waters

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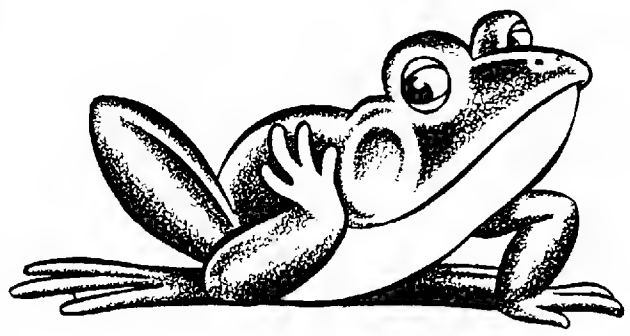
Bull. Chicago Herp. Soc. 48(10):136, 2013

The Tympanum



Does anyone have a ultrasound "reader" and the expertise to detect the presence of testes and ovaries in western diamondback rattlesnakes (*Crotalus atrox*)? I am interested in determining the possible presence of both kinds of reproductive organs in a dozen specimens I have on hand that range between 1 to 5 feet in length. Note: FYI, some years ago when Dr. Jean Dubach was directing Brookfield Zoo's genetics lab we identified parthenogenesis in the Arafuran file snake (*Acrochordus arafurae*) which lead to an article by Dubach, Sajewicz and Pawley in *Herpetological Natural History* regarding the incident.

Here in Lincoln County, New Mexico, a year or so after the onset of the present drought in this part of the Chihuahuan Desert I found that the ratio of males to females appears to have gone up dramatically. For the last 3 years out of a total of 2 dozen rattlesnakes only one female has been identified (by morphology and probing). In spite of an apparent lack of females I have found 2 youngsters, one of them a yearling, this past summer.

Going back in time to about 30 years ago I had exhibited 2 adult male eastern diamondbacks (*Crotalus adamanteus*) in a large enclosure at Brookfield Zoo. Each male copulated with the other during the first year that they were in each other's company and consequently both developed necrotic hemipenes which had to be amputated. They survived the surgery and later (within one year) they each produced 1 or more living offspring plus some infertile ova.

This extraordinary event was never published. It is worth noting that in my attempt to locate any further information on the subject, Dr. George Rabb put me onto an article that had come out of Instututo Butantan some years before which reported incidents of hermaphroditism having been observed in less than 5% of snakes autopsied of the Genus *Crotalus* from that region of South America.

My question: During periods of extended drought is it possible that the incidence of hermaphrodism in otherwise "male" snakes goes up? At this time I have 6 specimens of *Crotalus atrox* that I would like to have "read" along with 4 *C. molossus* from the Sacramento/Capitan mountain locations. Depending on distance, I would be able to transport the animals to wherever a machine and technician could reliably read the sex of the animals. I would anesthetize the snakes prior to their being read. Ultimately I would like to positively determine the presence of both kinds of gonads in each snake without subjecting them to a surgical procedure.

I can be reached at: **raypawley@pvtnetworks.net**

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In fond remembrance of Ilene Sievert, who died December 16, 2012, this year we will reprint several of the essays that Ilene wrote for these pages between 1988 and 1993 under the rubric "Frog City." This one is from February 1993.

Frog City
by Ilene Sievert

X. House Music

In the outdoors one enjoys or endures what one must of animal noises; this is where they live. But in one's own home the repetitious sounds of animal creation, from within or out, may aggravate a sullen and grouchy soul. The very worst, recalled from student days, was an upstairs neighbor's female cat in the grip of sexual desire, a prolonged and agonizing desire cured by a vet. With more prosperous times and fancier animal, an afghan hound would commence barking and howling at 3 A.M. from an outdoor pen below our bedroom window. Impenetrable conscience and whole house air conditioning prevented the owner from hearing the dog. The next day when courteously informed of the disturbance disavowal was always made; they heard nothing and was I sure it was their dog? Be warned. A mother of young children can have very hateful thoughts about whatever deprives her of the few tattered rags of rest. Thereafter each time the dog awakened me, at whatever hour and for the however often time, the afghanner family was dialed, however many rings it took to get them, and pardon, but it appears your dog is barking. After three nights it was back to howling of my children only.

Many calls of birds are quite pleasant but some are annoying; the monotonous coo coo coo of doves, the endless grating chatter of multiple parakeets. The squawks and screams of the larger parrots surpass annoyance and have been known to saw the human brain into jagged fragments, probably causing more frequent occurrence of mental breakdown in the tropics and the dialect of Australians. On the other hand, the excitement of a clan of crows or tribe of jays, though the sounds are harsh, has the charm of a noisy bunch of kids playing ball. They pipe down when the incident of stimulus is over. Their sound rises and falls with events and can bring me running to the window to see what's happened.

It surprises me, with my irritable temper and intolerant attitude towards intrusive noise, how pleasant it is to hear in the privacy of home, the call of a frog. Call, singular, is apt as population size precludes choral works. The song itself is rarely lovely. Our only truly musical frog was Larry the bullfrog with a fine haroooooommmm like a bassoon in mezzo forte. He called in warm weather starting at about 9:30 P.M. with a longish concert of 4–5 calls, a rest, and a few repeats. The hotter weather brought encores later and later until he would wake us in the A.M. "Damn frog," Paul would mumble, roll over, and resume snoring, but with less timbre than Larry. On the opposite end of the range, peepers would give some fine shrill soprano notes like the peeps of the smallest wooden recorders. Most other species had variations on brack & quack. Tree frogs, wood and leopard frogs sang mostly in warm, but especially in wet weather, hushing if approached but betrayed by bubble throat, full and shiny or recently deflated with wrinkles like yesterday's birthday balloon. The worst bracker was a little paradox frog. He went BRAAACKKK! in triple forte and repeated until violent hands approached. I expostulated, exhorted and excoriated him till I was exhausted on how unbecoming it was for such a very small frog to make such a loud noise. I suggested that a female might be actually amused at the discrepancy between call and caller, but he just kept saying "BRAAACKKK, I feel great! Bring me a dame!" Since a dame paradox could not be obtained he had to spend summers in a much smaller tank from which he would not call. He was a precious dandy in gaudy striped pants. I suspect, proud fellow that he was, he did not care to invite a lady into such a small cheap apartment. Male mink frogs, also brackers, were more interesting, and therefore tolerable, as their calls were made in status competition among themselves, interactive call and response, rolling out their brrrrracks and punctuating with staccato barks. It was professional wrestling with splashes and croaks instead of thumps and grunts.

A visiting solitary crawfish frog, a male named Lumpy, had deep toned calls reminiscent of serious internal digestive disturbance. I am told a chorus is quite impressive. If a human guest was present when Lumpy called I was careful to remark that it was the frog that made that sound. Of course Lumpy when pointed out would then shut up and pretend it was me.

The most mysterious calling is a sound like the distant belling of hounds across miles of clear country air. I do not live anywhere near the country; the windows are closed. I live far from the Animal Shelter and farther from any kennel. The soft hoo hoos are from the fire-belly toads who vibrate their throats but don't have a visible sac. They call and answer each at a different pitch but all quietly and without consonants, a string of single notes per caller. Amplexus brings forth a soft trill from the individual whose inguinal area is clasped, a sound so sweet that one can't tell if it is protest or approval.

There are many "house calls" I've missed; the sweet trill of American toads and the loud tunnggg! of the green frog. The rude noise of a pig frog would go well with the intestine rumbling of the crawfish frog. Spare me the very loud tropical frogs which are probably in league with the parrots, but otherwise, give me more frog voices, especially good solid all-American anurans, more joyful than canaries.

It was all explained by my friend, Judith the Wise. We were having dinner of an evening in the same room as dwell the froggy guests. Despite human noise, the movements of several people around the room, the conversation and clack of utensils, a young *Hyla regilla* started singing. Again and again he called. The ladies smiled and gazed fondly while the gentlemen looked amused and embarrassed. "He has accomplished his purpose," she said. "He has attracted and pleased all the females with his song."

Unofficial Minutes of the CHS Board Meeting, September 13, 2013

The meeting was called to order at 7:44 P.M. at the Schaumburg Public Library. Board members Josh Baity, Stephanie Cappiello, Jim Foster and Cindy Steinle were absent.

Officers' Reports

Recording Secretary: The minutes of the August 16 board meeting were read, discussed and accepted.

Treasurer: The August treasurer's report was given, discussed, and accepted. We paid an insurance premium for a required auto liability policy. Andy has researched some options regarding the safety of our treasury. Options include obtaining fidelity coverage on the board members, and having board members receive daily email statements.

Membership Secretary: Numbers are holding at just under 500. The list of expiring memberships was read.

Publications Secretary: Aaron has added this year's January–June *Bulletin*s to the website.

Sergeant-at-arms: August meeting attendance was 47.

Committee Reports

Shows:
- Meet the Creek, Kiwanis Park, Brookfield, 12:30–4 P.M., September 14.
- Westmont Pet Promenade, September 14.
- Hike and Seek, National Wildlife Federation, Bemis Woods, Western Springs 12–3 P.M., September 28.
- Blessing of the Animals, Pullman, Noon, October 6.
- NARBC, Tinley Park, October 12–13.
- 3-in-one Expo, Arlington Park Racetrack, November 9–10.
- SEWERFest, November 10.

Old Business

Herps of Illinois exhibit: Comments on Erica's guidelines and Mike's edits were positive.

Junior Herpers: Thirty-five people attended the September meeting for Dan Bavirsha's talk! Mike Scott provided prizes for a coloring contest. Todd Gray, DVM, will speak in October, and Karen Furnweger from Shedd Aquarium in November.

Nominating Committee: will be meeting soon.

Meeting attendance: Erica is working on ideas to increase attendance, updating Facebook pages and Herp of the Month. John Archer suggested advertising that free parking is available.

New Business

Cage donations: The board discussed the possibility of donating cages to nature centers who house native animals for the Herps of Illinois exhibit at ReptileFest. These might feature our name and info about 'Fest.

Junior Herpers: The possibility of field trips was dicussed. Problems may occur with transportation and liability issues.

CHS 50th Anniversary 2016: Our 50th anniversary is coming up in 2016. Suggestions included a party, hosting the Midwest Symposium that year, and a commemorative poster.

Round Table

Dick Buchholz, at the August PNNM weekend, met a man from Louisville who does outreach programs.His daughter enjoyed the Junior Herpers meeting. Dick and Mike Scott visited him during a recent trip to the Louisville area

Jessica Tschampa's wedding is coming up in 2 weeks.

Mike Dloogatch received an email from one of the founding members of the CHS asking if he had copies of any early membership lists. He found one and she enjoyed reading through the list of members from the early days of the society. He has also been in touch with a previous president, Lori King, whose husband is seriously ill. Our thoughts are with Lori and Charlie at this difficult time and we wish them well.

Charles Schurman is waiting on baby Solomon Island tree boas.

Aaron just got new pygmy chameleons, really cool!

Jason had more baby snakes arrive—no CPR necessary this time!

The meeting was adjourned at 9:23 P.M.

Respectfully submitted by recording secretary Jenny Vollman

Advertisements

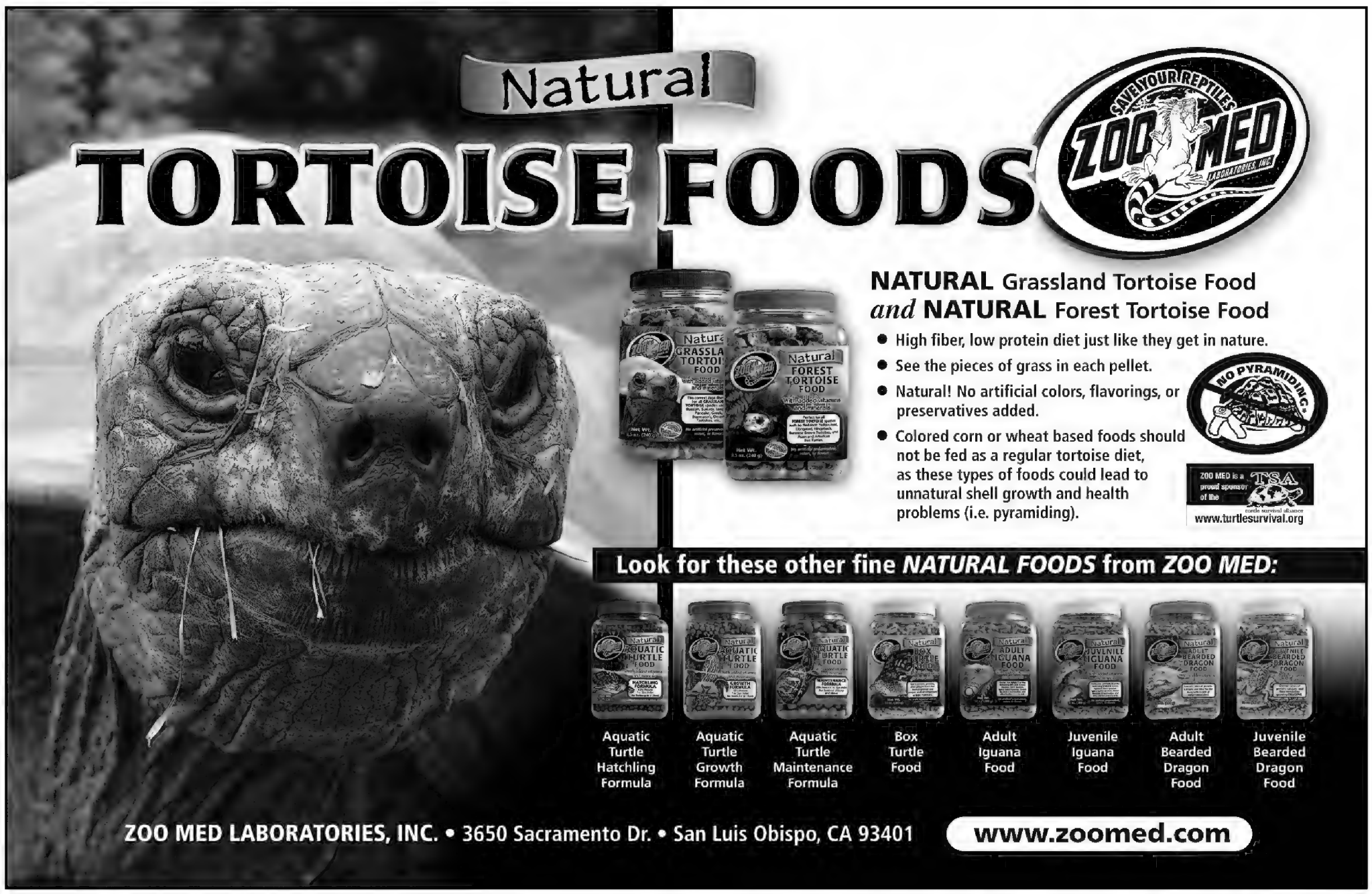
For sale: rats and mice—pinkies, fuzzies and adults. Quantity discounts. Please send a SASE for pricelist or call Bill Brant, *THE GOURMET RODENT*, PO Box 430, Newberry, FL 32669-0430, 352-472-9189, E-mail: GrmtRodent@aol.com.

For sale: **highest quality frozen rodents**. I have been raising rodents for over 30 years and can supply you with the highest quality mice available in the U.S. These are always exceptionally clean and healthy with no urine odor or mixed in bedding. I feed these to my own reptile collection exclusively and so make sure they are the best available. All rodents are produced from my personal breeding colony and are fed exceptional high protein, low fat rodent diets; no dog food is ever used. Additionally, all mice are flash frozen and are separate in the bag, not frozen together. I also have ultra low shipping prices to most areas of the U.S. and can beat others shipping prices considerably. I specialize in the smaller mice sizes and currently have the following four sizes available: Small pink mice (1 day old—1 gm) , $25 /100; Large pink mice (4 to 5 days old—2 to 3 gm), $27.50 /100; Small fuzzy mice (7 to 8 days old—5 to 6 gm) , $30/100; Large fuzzy mice / hoppers (10 to 12 days old—8 to 10 gm), $35/100 Contact Kelly Haller at 785-234-3358 or by e-mail at kelhal56@hotmail.com

For sale: High quality, all locally captive-hatched tortoises, all bred and hatched here in the upper midwest. Baby leopards, Sri Lankan stars, and pancakes usually available, and are all well-started and feeding great! Leopards are $125 ea., Sri Lankans (2012 hatched) $475 ea. And Pancakes are $195 ea. Leopards for out of state sale/shipping require a veterinary health certificate (inquire for cost). E-mail at KKranz1@wi.rr.com or call Jim or Kirsten at 262 654 6303.

Herp tours: **Costa Rica herping adventures**. Join a small group of fellow herpers for 7 herp-filled days. We find all types of herps, mammals, birds,and insects, but our target is snakes. We average 52 per trip, and this is our 10th year doing it. If you would like to enjoy finding herps in the wild and sleep in a bed at night with air-conditioning, hot water and only unpack your suitcase once, instead of daily, then this is the place to do it. Go to our web-site http://hiss-n-things.com and read the highlights of our trips. Read the statistics of each trip and visit the link showing photos of the 40 different species we have found along the way. E-mail at jim.kavney@gmail.com or call Jim Kavney, 305-664-2881.

Line ads in this publication are run free for CHS members—$2 per line for nonmembers. Any ad may be refused at the discretion of the Editor. Submit ads to mdloogatch@chicagoherp.org.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News and Announcements

2014 CHS HERPETOLOGICAL GRANTS PROGRAM

The mission of the Chicago Herpetological Society is education, conservation and the advancement of herpetology. To further this mission, the CHS provides grants of up to $1,000 in the following categories:

1. Illinois Herpetology
2. Graduate Student Research in Herpetology
3. Undergraduate Research in Herpetology
4. Conservation
5. Captive Management, Husbandry and Propagation

The number of grants awarded in each category will depend on the grant applications received; it is possible that not all categories will receive awards and some categories may receive more than one award. The Grants Committee reserves the right to reassign the category under which a given proposal is submitted.

To qualify for a grant, the applicant must be a member of the Chicago Herpetological Society as of December 31, 2013. In accepting a grant, the recipient agrees to acknowledge the Chicago Herpetological Society in any publications or public presentations of research funded by this grant. Further, the recipient agrees to abide by all state and federal laws.

Recipients must submit a short report of their research findings to the CHS within 6 months of their anticipated completion date. The report should be written for a general audience and be suitable for publication in the CHS *Bulletin* or on the CHS webpage. This requirement may be waived if results will be published in a peer-reviewed journal within a year. Recipients may be invited to present a program at a CHS general meeting.

Applications must include the following:

1. Project title
2. Applicant's name, address, phone and email
3. Submission category
4. Introduction—Provide background for the proposed work. Include a clear statement of the objectives of the proposed work.
5. Materials and methods—Describe the study site and the materials and methods (in non-technical terms) that will be used to accomplish the objectives of the proposed research. Attach plans, diagrams and maps as necessary. Indicate whether you have an approved Animal Care (IACUC) protocol covering the proposed methods or whether you will be submitting such a protocol.
6. Applicability and broader implications—How does this work apply to conservation, education and the advancement of herpetology?
7. Budget—Indicate the budget for the entire project and make clear what portion the CHS grant money would fund.
8. Anticipated completion date for the research
9. Applicant curriculum vitae
10. Letters of support—Student applicants must include a letter of support from a faculty advisor. For non-academic individual and institutional applicants, letters of support from collaborating partners or institutions are strongly encouraged. Letter(s) of support may be emailed and should include an address and phone number at which the writer can be contacted. Letter(s) of support may also be sent by postal mail.

Proposals should be submitted as email attachments. Attachments should include the applicant's name in the file name. Proposal text should not exceed five double-spaced pages (excluding literature cited, applicant's CV, and letters of support) and should be typed using a common font (e.g., Arial, Times, Courier) no smaller than 10pt. Applications must be received by December 31, 2013, and awards will be announced by February 15, 2014.

Proposals should be emailed to grants@chicagoherp.org

Questions should be directed to Mike Dloogatch (773) 588-0728, or grants@chicagoherp.org

UPCOMING MEETINGS

The next meeting of the Chicago Herpetological Society will be held at 7:30 P.M., Wednesday, October 30, at the Peggy Notebaert Nature Museum, Cannon Drive and Fullerton Parkway, in Chicago. **Jennifer Stabile**, amphibian conservation coordinator and senior keeper at the Albuquerque BioPark Zoo, will speak on "Conservation of the Mona Coqui (*Eleutherodactylus monensis*). In the heart of the Caribbean lies Mona Island, roughly halfway between Puerto Rico and Hispaniola. Mona is often referred to as the Galapagos of the Caribbean, and has been designated as a natural reserve by the government of Puerto Rico. The Mona Island coqui is a medium sized frog and is endemic to Mona. It is the least studied of the 17 Puerto Rican frogs of the genus *Eleutherodactylus*. An ex situ captive breeding program for *Eleutherodactylus monensis* was started in order to: (1) establish a captive assurance population; (2) learn about its reproductive biology; and (3) provide education and outreach opportunities for this unique species.

The November 27 meeting will include the annual election of officers and members-at-large of the CHS Board of Directors. The program for this meeting has not yet been decided.

The regular monthly meetings of the Chicago Herpetological Society take place at Chicago's newest museum—the **Peggy Notebaert Nature Museum**. This beautiful building is at Fullerton Parkway and Cannon Drive, directly across Fullerton from the Lincoln Park Zoo. Meetings are held the last Wednesday of each month, from 7:30 P.M. through 9:30 P.M. Parking is free on Cannon Drive. A plethora of CTA buses stop nearby. Free parking is available in the walled-in area to the south of the loading dock ramp.

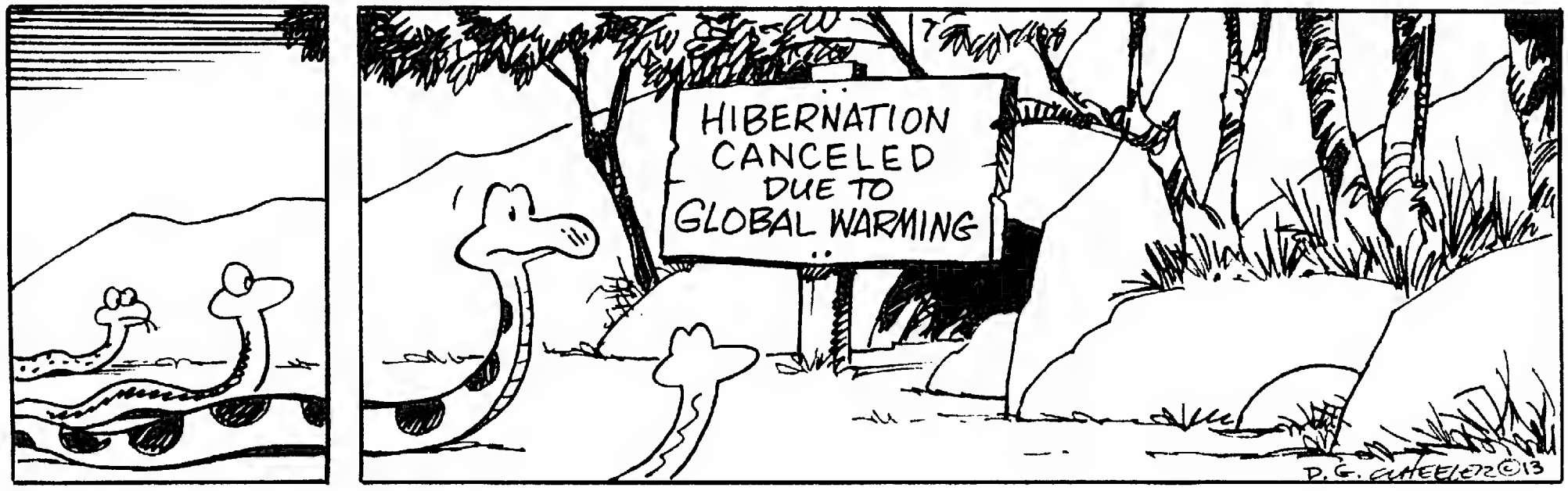
Board of Directors Meeting

Are you interested in how the decisions are made that determine how the Chicago Herpetological Society runs? And would you like to have input into those decisions? If so, mark your calendar for the next board meeting, to be held at 7:30 P.M., November 15, in the adult meeting room on the second floor of the Schaumburg Township District Library, 130 S. Roselle Road, Schaumburg.

The Chicago Turtle Club

The monthly meetings of the Chicago Turtle Club are informal; questions, children and animals are welcome. Meetings normally take place at the North Park Village Nature Center, 5801 N. Pulaski, in Chicago. Parking is free. For more info visit the group's Facebook page.

THE ADVENTURES OF SPOT



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Volume 48, Number 11
November 2013

A Primer on Ranaviruses . . . . . David S. Lee 141

What You Missed at the October Meeting . . . . . John Archer 149

Herpetology 2013 152

Unofficial Minutes of the CHS Board Meeting, October 18, 2013 155

News and Announcements 155

Advertisements 156

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A Primer on Ranaviruses

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If you are a turtle, a frog or even a tadpole you need to read this—it's really scary!

Forget vampires and zombies. There is a real cold-blooded killer out there, a pathogen named *Ranavirus*. As the label implies, it is not exactly frog friendly, but it also causes illness and death in salamanders, reptiles and fish. This virus is now found worldwide. Transmission is rapid and can result from either direct or indirect contact with infected animals. The virus enters cells of the host and takes over the cell processes for its own replication. Ranaviruses can infect multiple cell types and cell death can occur in as little as nine hours, quickly leading to loss of organ function. Susceptibility varies with species. In some frogs, for example, mortality can result in just three days. Experiments done on infected and uninfected salamanders showed the virus could be transmitted when the salamanders were in contact for as little as one second (Brunner et al., 2007). Exposure to water or soil contaminated with *Ranavirus* can also result in disease.

History and background

Ranaviruses are believed to have evolved in fish and only later began to infect amphibians and reptiles (Jancovich et al., 2010). This genus of viruses was first reported from amphibians in the 1960s in a population of northern leopard frogs, *Lithobates pipiens* (Granoff et al., 1965), yet the impact of widespread virus-related die-offs was not recognized until the 1990s. Research experiments demonstrate that the virus can be transmitted within and between three classes of vertebrates.

Since the mid-1990s *Ranavirus* has been taking a devastating toll on native populations of reptiles and amphibians across the U.S. Especially hard hit are frogs, toads, salamanders and their larvae, as well as turtles. Hundreds of thousands of these animals have died from the lethal virus and the disease continues to spread. The cause of the sudden appearance of a global plague from this pathogen is uncertain, but possibilities include trade in food and ornamental fish, reptiles, amphibians, and/or its emergence from unknown reservoir hosts resulting from changes in the environment.

Ranavirus has been documented as being responsible for amphibian die-offs, some of them massive events, in over 20 states. To date over 85 species of turtles and amphibians have been involved with the die-offs, where mortality can range from a few individuals to thousands. In some cases where amphibian breeding sites support a number of frogs and/or salamanders the die-offs involve multiple species. Ninety-four percent of the known cases of *Ranavirus* have been reported since 1998. While to some degree this represents a growing awareness of the problem, this figure strongly suggests that the virus is becoming more common and widespread.

Die-offs of amphibians have been reported on private, state and federal lands, including several national parks and wildlife refuges. To date, most of the species involved are relatively common, but the virus has also caused problems for populations of threatened and endangered species. The reasons for the emergence of *Ranavirus* in wild populations vary from site to site. Often there are stress-related elements, man-made or natural, associated with outbreaks. Disturbance of the site and/or pollution are important but not necessarily required factors. The virus exists in aquatic habitats: ponds, lakes, permanent wetlands and vernal amphibian breeding sites. Turtles and breeding adult amphibians moving into recently flooded wetlands are likely carriers of the disease. A common factor in *Ranavirus* outbreaks is the rapid drying of wetlands. This apparently is because the drying concentrates turtles and amphibians and accelerates metamorphosis. The immune system of amphibians is suppressed during transformation to the adult stage, increasing the chance of pathogen infections, and disease.

Ranaviruses are members of the Iridoviridae, a group of double-stranded DNA viruses. There are six recognized species and numerous strains, however in North America viruses related to the *Ambystoma tigrinum* virus (ATV) and Frog virus 3 (FV3) appear to be the most important to reptiles and amphibians. The Bohle iridovirus (BIV) from Australia is also of concern. Some ranaviruses may be able to infect more than one class of vertebrates (e.g., amphibians, reptiles and fish). The incubation period is variable—five days to several weeks. The virus was identified in skin, intestines and kidneys of African clawed frogs, *Xenopus laevis*, within three hours of introducing them to infected water (Robert et al., 2011). Ambient temperatures, dose of virus exposure, immunosuppression, the host's developmental stage, and species differences in susceptibility to various *Ranavirus* strains probably affect infection timing. Ranaviruses replicate only at temperatures between 12 and 32°C; because of this, birds and mammals are not suitable hosts (Chinchar, 2002). The virus can remain viable in frozen fish for over two years (Langdon, 1989).

Three genera of viruses of the family Iridoviridae affect fish. Ranaviruses and megalocytiviruses are pathogens that have recently appeared. Both types cause severe disease outbreaks, occur globally, and affect a broad spectrum of hosts. The hematopoietic necrosis virus from Australia was the first *Ranavirus* found to cause epizootic mortality in fish. Like other ranaviruses it lacks host specificity. A distinct but closely related virus, European catfish virus, occurs in fish in Europe, while very similar ranaviruses appear in fish and amphibians in Europe, Asia, Australia, North America and South America. These viruses can be distinguished from one another and this could

allow policies of the World Organisation for Animal Health (OIE) to minimize their spread. However, at this time limited information and variations in disease expression create difficulties in sampling strategies, and there remains uncertainty surrounding the taxonomy of some ranaviruses (Whittington et al., 2010).

All types of amphibians including salamanders, newts, frogs and toads are susceptible. Larvae and metamorphic stages are most often associated with massive mortality events. Adult amphibian morbidity and mortality are reported less often, but have been observed in the wild, as well as in captivity. Some species may have covert infections and be able to shed and transmit virus to other susceptible animals without ever exhibiting clinical signs. Likewise, nonlethal infections have been documented and it is likely that these latent infections explain the persistence and emergence of the disease in both wild and captive populations. Ranaviruses found in fish, amphibians, and types of other reptiles may serve as reservoirs for susceptible chelonians.

Ranavirus is but one of a number of viral pathogens that have been reported in turtles. The two important viral diseases of freshwater and terrestrial chelonians are herpesvirus disease in tortoises (multiple clinical signs and high mortality may occur) and iridoviral (*Ranavirus*) disease. See Origgi (2006) for a review of herpesvirus disease of tortoises and Jacobson (2007) for a general and comprehensive review of chelonian viral diseases. Recently, occurrence of *Ranavirus* in lizards has also been documented (Stöhr et al., 2013).

Johnson et al. (2008) report affected species that included captive Burmese star tortoises, *Geochelone platynota*, a free-ranging gopher tortoise, *Gopherus polyphemus*, free-ranging eastern box turtles, *Terrapene carolina carolina*, and a Florida box turtle *Terrapene carolina bauri*. They also found evidence for *Ranavirus* infection in archived material from previously unexplained mass mortality events of eastern box turtles from Georgia in 1991 and Texas in 1998. *Ranavirus* infections were also found in sympatric species of amphibians at two locations with infected chelonians. The profiles of *Ranavirus* isolated from a dead Burmese star tortoise and a southern leopard frog, *Rana utricularia* (= *Lithobates sphenocephalus*), found nearby, were similar. These findings support the ideas that certain amphibians and chelonians are infected with a similar virus and that different viruses exist among different chelonians. Amphibians may serve as the major reservoir host for susceptible chelonians. This study also demonstrated that significant *Ranavirus* infections are likely more widespread in chelonians than previously suspected.

Eastern populations of tiger salamanders (*Ambystoma tigrinum tigrinum*) are listed at some level of conservation concern in almost every state in which they occur; in most they are considered endangered. Most populations are isolated, disjunct, and both their overall numbers and range are declining. Titus and Green (2013) reported *Ranavirus* in populations of tiger salamanders on Long Island. Thus, the threat of this virus to populations of endangered species is no longer to be considered as just a potential one, it's real.

Death from the virus is not pretty. In amphibians the disease is likened to Ebola or epizootic hemorrhagic disease due to body swelling and hemorrhaging. Hemorrhagic lesions are characteristic of fish with *Ranavirus* infections and often in reptiles as well. Tissue necrosis is extensive because the virus commandeers multiple cell types.

Recognition

Infection does not always cause disease. Long-term non-clinical carriers have been identified. Clinical signs vary depending on the host and a number of other factors.

In infected **fish** the hematopoietic tissue is usually severely affected. General pathological signs include pale gills and liver, friable kidneys and livers, and ecchymosis and petechiation on ventral body surfaces. Fish with *Ranavirus* often exhibit no external symptoms. Both fresh and saltwater species are affected, and the virus can be spread to animals eating live, dead, or previously frozen infected fish.

In **amphibians** ranaviral outbreaks can result in sudden onset of illness; in a wetland often hundreds or thousands of sick individuals are seen over a one- to five-day period. Overall mortality rates in larvae and juveniles will exceed 90%. A good indication of disease is lethargic animals swimming erratically and weakly, or on their sides. Infected frogs and salamanders typically have subtle to severe hemorrhages on the ventral surface, particularly at the base of the hind limbs, and around the vent. In some cases hemorrhages are present from the chin to the tip of the tail; at other times they may appear in specific sites or as irregular patches. The abdomen may also become enlarged and reddened (redleg-like symptoms) and amphibians may have skin ulceration and/or epithelial proliferation. Mild to severe fluid accumulations can appear under the skin of the abdomen and hind legs. Hemorrhaging also occurs in multiple tissues, especially the liver, kidney, heart tissue, and digestive tract. Red-tinged or clear fluid accumulations may appear in the body cavity.

Turtles infected with this virus show overall weakness, swollen eyelids, exhibit discharge from the mouth and nose, and the tongue and palate often show dull white or thick yellow plaques. In some cases turtles may have ulcers on the bottoms of their feet. Conjunctivitis and subcutaneous edema of the eyelids and neck have also been noted. Mortality is high and other clinical signs can include pharyngeal ulcers, skin sloughing, and marked lethargy (Duncan, 2011). White dissection plaques can also be found in the pharynx and esophagus. Infections spread throughout the body affecting many organs, including blood vessels. Other studies show consistent lesions in affected turtles included necrotizing stomatitis and/or esophagitis, fibrinous and necrotizing splenitis, and multicentric fibrinoid vasculitis. Intracytoplasmic inclusion bodies were rarely observed in affected tissues (Johnson et al., 2008). In terrestrial turtles lesions are perhaps more difficult to detect as they are primarily in the oral cavity and associate with internal organs (typically respiratory and gastrointestinal), but can also include eye and nasal discharges. Aquatic turtles exhibit hemorrhages and ulcers, with the ulcerations occurring along respiratory and digestive tracts. Death results from organ dysfunction and secondary infection by other pathogens.

Potential Impacts

There is no question that *Ranavirus* outbreaks are now common and the virus is widespread. Allender et al. (2013) examined 606 eastern box turtles from across the southeastern United States and found a 1.3% prevalence of *Ranavirus*. There was a higher infection rate in juveniles than adults, but the difference was not significant. This seemingly low percentage of infected box turtles is misleading, and the authors of the study suggest that the low detection prevalence is a result of the quick time from exposure to development of the disease and death of the turtles. This would mirror the findings for amphibian *Ranavirus* mortality with the difference being the sick and dead amphibians are more easily identified due to their seasonal concentrations at breeding sites.

In that a number of our endangered and threatened species have restricted distributions and survive in relatively small populations, they are potential targets for extinctions resulting from ranaviruses. So too are numerous peripheral populations of reptiles and amphibians, many of which are state-listed as species of conservation concern. Species endemic to specific springs and spring runs, those confined to narrow elevation zones on isolated mountains, and fish and turtles whose distributions are limited to single drainage systems would seem very vulnerable. In the latter case infected bait-fish released by fisherman could contaminate independent drainage systems with novel ranaviruses. Subterranean species of blind cave-dwelling fishes and salamanders are at risk. Aquatic cave-dwelling animals typically live at very low population levels and entire underground aquatic systems could quickly succumb to the virus. D. S. Lee (1969) reported on the occurrence of bullfrogs in pools deep within cave systems, and other types of amphibians commonly inhabit the twilight zones of caves. Both represent potential avenues of *Ranavirus* transport into subterranean systems where the cool ambient temperatures of cave systems would prove favorable to the virus.

The spread of *Ranavirus* to sites harboring isolated amphibians could result in loss of subpopulations. Narrow-range endemics, as well as relict, disjunct and peripheral populations are vulnerable, and could be quickly extirpated. Distant transport of the pathogen by contaminated boots, field equipment, or release of infected animals to biologically significant remote sites is a real concern. This is exacerbated by the different strains of *Ranavirus*, and their ability to infect a wide spectrum of hosts. Over time the emergence of novel viruses could occur across a broad landscape. Furthermore, roads, pipelines, and development have fragmented landscapes to the point that if isolated populations of even common and widespread species are extirpated, natural recolonization is unlikely to occur. Nonetheless, development induced isolation does not fully protect sites from exposure to *Ranavirus* as there are a number of anthropomorphic dispersal mechanisms for the virus.

People maintaining captive collections of turtles and tortoises outdoors run the risk of locally occurring amphibians infecting them. Native frogs frequently take up residence in outdoor pools set up for aquatic turtles, and even a single infected frog could easily contaminate an entire collection. Additionally, *Ranavirus* can survive in fresh and frozen fish. This is another means for the disease to infect facilities maintaining captive turtles.

How we are likely aiding and abetting

This virus can remain viable outside a host for 30 days or more (Nazir et al., 2012). Boots and field equipment that come in contact with water and sediments contaminated with *Ranavirus* can later spread the pathogen to other areas. This is also likely to occur with the chytrid fungus (*Batrachochtrium dendrobatidis*) that affects amphibians. The spread of these diseases is also the result of visitation to wetlands for recreational activities. Studies conducted in the Great Smoky Mountains National Park found a higher *Ranavirus* prevalence in salamanders at sites with high public access. Additionally, livestock and agricultural pesticides in wetland areas stress hosts increasing the likelihood of *Ranavirus* outbreaks (Gray et al., 2007).

The release of individual captive animals is an ongoing problem. Virus-infected pets, both commercially purchased and wild-caught captives, can harbor ranaviruses asymptomatically, and the serendipitous broadcasting of the disease to native species is a major concern. While some states have regulations forbidding the release of captive reptiles and amphibians into the wild, they are almost impossible to enforce. Additionally many well-intended people and organizations translocate animals to new localities as natural habitats are lost to development. This is yet another avenue for the unintended dispersal of *Ranavirus*. Attention needs to be focused on wildlife rehabilitation centers. Often their goal is to help sick animals resolve their health issues so they can eventually be released. Fortunately the staffs of the centers can be trained to identify clinical signs and reptiles and amphibians can be tested for the virus prior to release.

Establishment of exotic species may also add to the problem. *Ranavirus* has recently been documented in *Anolis* lizards in Florida (Stöhr et al., 2013). South Florida is probably the exotic *Anolis* capital of the world. Any exotic species comes with a potential for introducing novel pathogens.

Fish hatcheries and other commercial aquaculture practices can provide an environment for rapid adaptation of *Ranavirus* strains. Studies have shown that ranaviruses collected from hosts raised and maintained in captive facilities, such as bullfrog farms and bait stores selling minnows, were more virulent than those found in wild populations (Storfer et al., 2007; Hoverman et al., 2011). The appearance of this virus in Japan is suspected to have originated from captive-raised frogs being released into the wild (Une et al., 2009).

The number of fish hatcheries, fish farms, and commercial facilities where people pay to catch farm-raised fish in the United States is phenomenal. In North Carolina alone sales of farm-raised freshwater fish exceeds $16.5 million. On a worldwide basis 47% of the food fish consumed are farm raised. Hatcheries run both by federal and state agencies, as well as those managed by the private sector, present some major issues. The hatcheries overseen by wildlife agencies maintain their facilities for stocking streams and lakes for fishermen, while private hatcheries sell their fish to individuals wishing to stock

private farm ponds. In both cases the fish are dispersed widely, providing the potential for rapid wholesale spread of *Ranavirus*. Nelson (2010) reported *Ranavirus* from two ponds at Harrison Lake National Fish Hatchery in Charles City County, Virginia. Based on this the author then examined tadpoles from four warm-water fish hatcheries in Virginia to determine if they were infected with *Ranavirus*. The virus was detected in tadpoles in three of the four warm-water Virginia hatcheries. Temperature and the length of time a pond is filled with water were significant predictors of the proportion of tadpoles that tested positive for *Ranavirus*. Similar results were found by Nelson over multiple years. Obviously precautions should be taken to ensure that ranaviruses are not spread when fish are transferred from one hatchery to another, or to the wild, but also of concern is the likelihood of the spread of the virus via the native amphibians that use hatcheries and fish farms as breeding sites.

Some garden centers that supply plants and other items for backyard outdoor pools also sell tadpoles for stocking garden ponds. While the wholesale suppliers of these tadpoles vary from store to store, clearly the stock does not necessarily come from local sources. No matter the origin of these tadpoles, as well as the fish and aquatic plants offered for sale from the same display containers, they are potential dispersal agents for *Ranavirus*. In addition biological supply companies supply tadpoles for classroom use so that students can witness metamorphosis, often the young frogs are released after they transform. Maryland has posted a warning about this practice as it relates to the spread of *Ranavirus* and other diseases on their Natural Resources web site (http://www.dnr.state.md.us/wildlife/Plants_Wildlife/herps/catalogue_frogs.asp).

The release of unwanted "minnows" and salamanders used as fishing bait is yet another avenue for spreading the virus. Lee and Knight (1968) described the commercial sale of native salamanders for fishing bait in the eastern United States in the 1960s. While for the most part the commercial aspects of this are no longer in effect due to current wildlife regulations, the noncommercial practice continues. The appearance of *Ranavirus* outbreaks in the central United States was attributed to the sale and use of infected tiger salamander larvae (*Ambystoma tigrinum*) for fishing bait (Ridenhour and Storfer, 2008). This salamander is also widely used as bait in the southwestern states.

This, of course, leads to the question as to the extent of infections being spread from large lots of turtles distributed to domestic and foreign retail stores from our southeastern turtle farms. They annually market over 200,000 hatchling turtles, mostly red-eared sliders, within the United States, and sell 10 million overseas. In addition there are turtle farms where turtles are raised for meat, and others specializing in exotic and other high-end species for sale to the hobbyist. Due to the nature of turtle farming, where large numbers of adult turtles are maintained in overcrowded conditions where breeding stocks constantly are being supplemented with additional wild-caught turtles, outbreaks of ranaviruses are likely. The fact that many turtle farmers use scraps from commercial catfish farms and similar aquaculture sources increases the opportunity for contamination from other facilities. It has been demonstrated that novel strains have developed in various aquaculture facilities (e.g., bullfrogs, Hoverman et al., 2011; bait store fish, Gray and Miller, 2013) but to date commercial turtle farms have not been tested. Furthermore simply moving infected individuals long distances and releasing them can result in the emergence of novel ranaviruses (Ridenhour and Storfer, 2008).

Robert et al. (2007) identified African clawed frogs as a possible vector for *Ranavirus*. They found that adult frogs typically clear FV3 infections within a few weeks, but viral DNA was still present in their kidneys several months after they were experimentally infected. The virus was also detected in seemingly healthy frogs that were not deliberately infected. In this study the authors hypothesized that "covert FV3 infection" may occur in *Xenopus*. This finding and other aspects of their study suggest that FV3 can become dormant in resistant species making some species viral reservoirs. The use of African clawed frogs for this research is interesting in that during the 1950s and '60s this species was widely used for pregnancy testing. The species was imported in large numbers and shipped to clinics and hospitals throughout the country. In following decades dwarf clawed frogs, *Hymenochirus* spp., were imported and commonly sold along with aquarium fish in pet stores. The commercial global distribution of African clawed frogs is reportedly responsible for spreading chytrid fungus and accounts for the extinctions of various native frog faunas --i.e., 30 species wiped out in a Panama forest (J. J. Lee, 2013). Today there are a number of businesses, like *Xenopus* Express, that supply clawed frogs for medical use, research centers, and the pet trade throughout the country and as well as in international sales.

As pointed out earlier (D. S. Lee, 2012) *Ranavirus* could become particularly troublesome as a result of turtle races where wild caught, non-native captives, and pet store purchased turtles and tortoises, are all mixed together at the events. Some of these events are even held back to back with frog-jumping contest. While this virus is a serious concern, the potential impact on native turtle populations is but one of a number of important reasons that these turtle derbies should be restructured, if not eliminated altogether. A committee of people working in meetings for months would be hard pressed to come up with a more cost efficient and effective means than turtle derbies to spread a deadly pathogen into our native populations of reptiles and amphibians.

Add to this mix the various wholesale farm-bred fish, frogs and turtles imported from Asia and sold live as food items in Asian markets across the United States. These would prove likely vectors for ranaviruses, and possibly a source for establishing new strains of the disease in this country. A decade or so back I purchased several adult frogs from an Asian market for testing and they all were positive for chytrid fungus. This was brought to the attention of our state wildlife agency, but they were unwilling to enforce their injurious wildlife regulations due to possible ethnic backlash.

Another issue is the release of fish, turtles and frogs by Buddhists—a practice resulting from a cultural/religious history going back at least 2,000 years. Because of this, certain Buddhist sects release store purchased birds, fish, turtles and other creatures. The belief is that freeing animals back into the wild is a means of achieving blessing, and turtles and tortoises are

considered as the most karmaically valuable animals to release. The people are not particularly concerned with the survival of the animal; to receive blessings they simply buy and release them. This same practice occurs not just in Asia, but also in the U.S. and Canada with goldfish and hatchling sliders being the most common subjects for release (Maclachlan, 2011; Liao and Lee, 2012).

At other times Buddhists will purchase and release creatures when family members are sick, believing it helps with the healing process. Releases may occur daily until the person is fully recovered. This practice is feasible because of the low cost of a number of commercially available species. Twenty young sliders, for example, can be purchased in China for the equivalent of US$15 (CNY 100). The releases are not limited to hatchlings; adult and subadult sliders are often released en masse.

And let's not forget all the captive animals held in classrooms, typically individual locally caught creatures, brought in by students and held on display for the remainder of the school year. Usually they are assigned to some student to release prior to the summer recess.

Diagnosis, Testing and Treatment for *Ranavirus*

Polymerase chain reaction (PCR) is the most useful test and is becoming more widely available. Real-time PCR techniques allow detection of smaller amounts of virus, but to identify the group type (ATV or FV3 virus-like) of *Ranavirus* present, conventional PCR with DNA sequencing is required. Determining the specific species of *Ranavirus* usually requires cell culture, virus isolation, and molecular characterization. These techniques are not widely available outside of research laboratories. Conventional PCR can provide false-positive results if confirmatory DNA sequencing or Southern blot analysis is not performed. Histopathology is helpful to screen for lesions in sick animals, but lesions tend to be nonspecific unless intracytoplasmic inclusion bodies are seen. Virus isolation, immunohistochemistry, transmission electron microscopy, cell culture, and serology (not widely available or validated for most species) have also been used to identify infected animals (Duncan, 2011).

For laboratory analysis the best choice for tissue samples are ones collected at necropsy, especially liver, kidney and skin (if lesions are present). Frozen tissues are required for virus isolation and are generally best for molecular analysis as well, however, freezing does not work for histology. For histology, tissues should be submitted fresh or fixed in 70% ethanol or 10% neutral buffered formalin. Ethanol-preserved tissues may be used for some molecular testing. Formalin-fixed tissues may also be used for some molecular testing if the length of time in formalin is minimal (days to weeks). It is possible to perform PCR on paraffin-embedded tissues. Samples can also be collected from clinically ill animals via cloacal or pharyngeal swabs, tissue biopsy (tail clips), or blood samples. Plastic handled, rayon-tipped swabs are preferable for collection of PCR samples. If living animals are tested, results should be interpreted with caution, recognizing test limitations—a positive test result is more reliable than a negative result. Test sensitivity for antemortem PCR increases with time post-exposure and development of clinical signs of illness (Duncan, 2011). Individual laboratories can provide more information regarding screening.

While *Ranavirus* outbreaks are typically fatal, Wack et al. (2013) developed protocols to treat diseased turtles and prevent the virus from spilling over to other captive animals at the Maryland Zoo. Their work resulted in the survival of 14 of 27 captive eastern box turtles after an outbreak of *Ranavirus* in the summer of 2011. Their methods included strict quarantine guidelines, modified environments, intensive care—including nutritional support, and extensive multimodal medical treatment by the zoo's veterinary staff. The surviving turtles all successfully overwintered, far exceeding previous survival rates for box turtles with this virus. Hausmann et al. (2013) used 11 of these turtles to determine if they had developed an immunity to the virus. Seven turtles were inoculated with a dose of the same strain of the virus and four controls were injected with an equal volume of saline. The turtles were monitored for 9 weeks. Only one of the re-infected and none of the controls died. Except for the turtle that died, the inoculated turtles showed only minor signs of the virus, suggesting that the turtles acquired some level of immunity from their earlier exposure. The single box turtle that died exhibited intracytoplasmic inclusion bodies in the kidney, lungs, pancreas, liver, and vas deferens; vasculitis in the spleen, pancreas, lungs and liver; nephritis; pneumonia; esophagitis; hepatitis; and enteritis. (It appears that the virus gained access to the zoo's outdoor box turtle exhibit by a visitor adding an additional turtle to the group. When the exposed turtles were brought in for treatment, one additional, previously unmarked, individual was discovered in the group.)

Quantitative tests have been developed that are 100% effective in detecting frog virus (FV3) in turtles. FV3 DNA can be identified in whole blood samples, oral swabs and cloacal swabs. Clinical indications of viral infections seen in experimentally infected red-eared sliders include lethargy, conjunctivitis, oral plaques and ulcers, while those in box turtles were fractures and diarrhea. Treatment with anti-viral therapy is reported to have poor success. Red-eared sliders, *Trachemys scripta scripta*, that were experimentally exposed to the FV3 virus had higher mortality rates when maintained at 22°C than at 28°C, suggesting that ranaviruses are less successful at higher temperatures. Analysis of infected box turtles showed a single oral dose of valcyclovir to have a positive effect, and that it may prove to be useful against the virus (Allender et al., 2013).

Precautions and actually doing something about this

Education regarding handling, maintaining, breeding, transporting, and selling farm-raised fish, bait fish, ornamental fish for outdoor ponds, and wild and captive bred pet trade reptiles and amphibians will become increasingly important. Restoration projects and stream and lake stocking that involve release of fish, reptiles and amphibians will need to verify that the released animals are free of the virus. In addition, field biologists, and the general public alike will need to be aware of the issues caused by ranaviruses. It is important that wildlife biologists working for government agencies, zoological facilities and wildlife rehabilitation centers understand the threat posed by ranaviruses and take proactive roles in preventing further spread.

Monitoring subsets of wild populations and captive collec-

tions of turtles and amphibians would be beneficial to track and control the spread and extent of this virus. Populations of rare and endangered species deserve special attention and commercial imports and shipments of fish, reptiles and amphibians, particularly ones reared en masse on farms and shipped in wholesale quantities for retail sales to the public, need to be regularly checked for the disease.

Partly as a result of concerns about *Ranavirus* outbreaks a number of state agencies have started taking a close look at turtle races. Maryland's DNR has made it known that turtles and frogs entered in race events may not be released back into the wild once the races are over. Both Pennsylvania and Maryland have started enforcing the illegal entry of state protected species (in Pennsylvania this includes box turtles) in turtle races. In part, based on *Herp Digest*'s Internet circulation of concerns about these races (D. S. Lee, 2012), several race sponsors canceled races altogether (e.g., see Moss, 2013b). At a number of events turtle advocate organizations are screening turtles to help insure that visibly sick and diseased turtles are not entered in the events, or allowed to have contact with other turtles. In the summer of 2013 a number of race sponsors across the country were approached by conservation organizations and asked to alter the way the races are currently conducted or to plan alternate events (e.g., Moss, 2013a). The Tortoise Reserve has information prepared by the veterinary community on the various reptile diseases that could be spread by turtle race activities. This is available to individuals or organizations interested in educating the various race sponsors via the Tortoise Reserve. Subsequently the Center for Biological Diversity started contacting sponsors of turtle races explaining their unintended consequences and suggesting that they modify the way races are conducted. Prior to the 4th of July turtle race in BelAir, Maryland, the Susquehannock Wildlife Society posted an online commentary about the problems the annual race was causing native wildlife asking the race sponsors to suspend the event in future years (http://www.daggerpress.com/2013/06/30/susquehannock-wildlife-society-calls-on-public-to-leave-wildlife-in-the-wild-this-fourth-of-july/). The majority of the comments posted were quite supportive of the Society's position, but it is interesting to read the mind-sets of some of the people commenting on this post who strongly believe that such traditional events should not be altered.

Preventing the spread of this virus will be taxing for those of us working daily with captive reptiles and amphibians. Disinfection of supplies, equipment, water dishes and caging that come in contact with the animals, or their water, is important. One-minute contact with solutions of 3 percent bleach, 0.75 percent Nolvasan® (chlorhexidine diacetate), or 1 percent Virkon® S (potassium peroxymonosulfate) are effective in killing the virus. Nolvasan is less toxic to amphibians. Disposable vinyl gloves should be rinsed, disinfected, or changed when handling different animals. While doing this is often not practical under field conditions, or when dealing with captive collections, minimally it should become standard protocol when changing field sites, or when exchanging specimens and housing between live collections. Particular care needs to be taken in and around habitats such as isolated wetlands that harbor peripheral populations, endemic species, species of state concern, and threatened and endangered species. Protocols need to be developed for people requesting access to these sites, and access will probably best be limited to those with permits and training. The release of captive amphibians and turtles will need to be limited to animals that have been tested for the virus. Stocking streams and lakes from fish hatcheries may no longer be a viable option. Additionally the sales of live fish, salamanders, frogs and turtles commercially raised on farms for bait, stocking, food and pets will need to be addressed, as possible release of these creatures into the wild by well-intended people will be difficult if not impossible to enforce. People overseeing zoos and private collections of amphibians and turtles need to be aware of the problem, particularly when acquiring new stock.

Natural resource agencies should consider conducting surveillance studies to identify infection hotspots, where ranavirus prevalence exceeds 40 percent (Hoverman et al., 2012; Gray and Miller, 2013). Once hotspots are located agencies can identify the mechanisms driving them, determine effects on populations, and come up with intervention strategies. Green et al. (2009) provide recommendations regarding sample size to detect the presence of *Ranavirus* as it relates to approximate host population size, and a 95% confidence level for detection. Large numbers of individuals from any given population will need to be tested to attain meaningful confidence levels.

It is interesting to note that the U.S. Department of Agriculture is poised to act quickly to oversee and regulate interstate movement of domestic animals and products that might possibly be infected with diseases where outbreaks can affect livestock, or spread Mediterranean fruit flies. Yet, diseases that seriously impact noncommercial native wildlife, and can be easily spread by our activities, continue to remain unchecked.

People interested in, and working with, reptiles and amphibians approach them from different perspectives. Academic researchers investigating wild populations deal with these animals quite differently than those working with them in labs. Amateur herpetologists who enjoy finding reptiles and amphibians in the field often share little in common with those who maintain captive collections of various color morphs and non-native species. Zoos, museums and nature centers are interested in educational displays, while veterinarians and wildlife rehabilitation groups focus on the health of individual animals. In addition, there are commercial collectors, exporters, importers, wholesale distributors, reptile show sponsors and pet shops. Boy Scouts working on merit badges, people rescuing turtles from roads, and retail purchasers are yet other user groups. They, along with the wildlife agencies overseeing the welfare of these animals, all need to be educated as to the plastic nature of ranaviruses if we are to have any hope of keeping this disease from becoming an outright worldwide plague.

Due to the broad, and growing, range of host species this pathogen is becoming a major threat to a significant portion of the earth's vertebrate fauna. With one in three species of amphibians and over 40% of the world's turtles already at risk of extinction the virus poses a serious additional threat to global biodiversity. Its impact likewise represents a significant problem for aquatic community composition and to the overall functioning of wetland and terrestrial ecosystems. The serious conse-

quences of this virus going, excuse the pun, viral cannot be overstated. We are witnessing a disease that can covertly breach the protective boundaries of state and national parks, wildlife refuges, and any number of private wildlife sanctuaries and similar lands that have been set aside to permanently preserve natural systems. With the potential consequences of expanding *Ranavirus* outbreaks on our native frogs and toads perhaps a follow-up book to Rachel Carlson's 1962 classic *Silent Spring* entitled *Silent Night* is now in order. A more fitting title might be *Night of the Living Dead*.

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For additional information see Manual Diagnostic Test for Aquatic Animals 2012. Infections with ranavirus. Chapter 2.1.2: 71-91, and the literature cited within [http://wahis2-devt.oie.int/fileadmin/Home/eng/Health_standards/aahm/2010/2.01.02_ranavirus.pdf].

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What You Missed at the October Meeting

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As I quickly glanced at the title of October's presentation I was a bit disappointed. I didn't know Jen Stabile, but I assumed she would deliver a fine talk; it was just that the title as it appeared on our website read simply "Amphibian Conservation." I know there are new members joining us frequently, but I've been a CHS member for a while and my interest in conservation had preceded my membership, so I was not looking forward to another talk rehashing facts that I already knew. If you've been even tangentially involved with amphibians and conservation you know something about the mysteries surrounding *Batrachochytrium dendrobatidis* (Bd) and the devastating effects it's having on the world's amphibians and you know that one of the biggest threats to virtually all the natural world is habitat destruction. We've had lots of speakers cover those topics in many and varied ways, and while always interesting, I just didn't feel the need for more info on the subject of amphibian declines unless we were to learn about a positive new approach to combat the declines.

Jen Stabile. Photograph by Dick Buchholz.

But if I had read the whole description of the talk I would have anticipated the meeting more eagerly. I met Jen Stabile and found her to be engaging and enthusiastic. When her opening slide appeared with the title "Biology and Conservation of the Mona Island Coqui" I started to become more interested. This wouldn't be a talk of all threats to all amphibians but rather a specific one, the Mona Island coqui (*Eleutherodactylus monensis*). And it would cover the frog's biology. Any animal's natural history is rarely boring for me. But I was still wrong in my judgment of Jen's presentation, because her talk went way beyond even her title to include natural history, a bit of travelogue, some taxonomy, a little geography, current husbandry, future directions, and a lot of humor.

Jen Stabile is the Amphibian Conservation Coordinator at the Albuquerque BioPark Zoo. In 2004 she began her professional career as a docent and intern at the Central Florida Zoo and Botanical Gardens. She interned at the Med Toxin and Venom Laboratory where she received her venomous training and in 2005 the Central Florida Zoo hired her as Reptile and Amphibian Keeper, later promoting her to Amphibian Conservation Coordinator. In 2011 she went to work in that capacity and as Senior Keeper of Herpetology for the Albuquerque BioPark Zoo. She has worked with Ray Ashton, the Florida Fish and Wildlife Research Institute, and Dr. Rafael Joglar of the University of Puerto Rico and Proyecto Coqui in Puerto Rico. She has over eight years of experience both in-situ and ex-situ working with the coqui frogs of Puerto Rico. I think her Facebook photo shows you her personality. She looks totally confident in a leather cowboy hat, plaid shirt and snake stick slung over her shoulder. Her fascination with coquis is evidenced by a tattoo on her wrist. It displays a petroglyph found in Puerto Rico representing the coqui.

She began by briefly mentioning the global amphibian crisis, highlighting the fact that the largest numbers of threatened species occur in Latin America, particularly the Caribbean. Of the 18 endemic amphibian species in Puerto Rico, three are thought to be extinct, 11 are of conservation concern and three are common. All 17 coqui species belong to the genus *Eleuther-*

One of the reasons Jen Stabile likes working with coquis (*Eleutherodactylus coqui*). They stay in one place longer than many frogs. Photograph by Gil Hidalgo.

The star of Jen's presentation, the Mona Island coqui (*Eleutherodactylus monensis*). Photograph by Jen Stabile.

A welcome sight after five hours in a small boat on rough seas. Mona Island has no airport and no permanent inhabitants. Photograph by Jen Stabile.

Mona Island has a diversity of habitats, with lush tropical forests near the base of the cliffs, very dry conditions on top of the plateau, and many caves. Photograph by Jen Stabile.

The reigning champions of Mona are the endemic rock iguanas, *Cyclura cornuta stejnegeri*. Photograph by Jen Stabile.

The lab at Albuquerque BioPark Zoo where Jen Stabile raises her coquis. The public has an excellent view. Photograph by Jen Stabile.

A hatchling Mona coqui. Jen's tattoo of the coqui petroglyph for size. Photograph by Jen Stabile.

A hatchling Mona coqui. Photograph by Jen Stabile.

odactylus. We saw pictures of the three extinct species and Jen explained that *Eleutherodactylus* translates as "free-toed"; the frogs have no webbing between their toes. Like many of that genus, coquis are all direct developing. Tiny, fully formed frogs hatch out of the eggs, which are often guarded and defended by the males. She had nice pictures of males guarding eggs and hatchlings. A new coqui species, *Eleutherodactylus juanriveroi*, was named as late as 2007. The common coqui, *E. coqui*, can be found throughout the island of Puerto Rico, even in the dry cactus-strewn habitats that Jen showed in photos.

And they've been introduced in Hawaii, where they are disparaged as not only an invasive species but also one with a loud and annoying call. Jen finds the call pleasant, as probably do most Puerto Ricans, who have lived with the frogs and their calls from birth. Puerto Ricans adore the little frogs, as evidenced by the ubiquity of references to the coqui, from coqui candy (" . . . made probably not *from* coqui frogs, but named *after* coqui frogs") to coqui earrings to coqui key chains. Jen said that the coqui is a national symbol of Puerto Rico that insinuates itself into the culture to a greater extent than the bald eagle does ours. Myths abound about the frog. One has a prince turned into a coqui to sing for his people and another that coquis cannot be removed from the island or they will stop singing or even die. The ancient people of Puerto Rico, the Taíno, left many petroglyphs of the frogs.

Jen then moved to her journey to the island of Mona. Maps placed the four- by seven-mile island about halfway between Puerto Rico and the island of Hispaniola in the infamous, at least to seafarers, Mona Passage. The island is a small national reserve with no permanent inhabitants surrounded by frequently rough seas and deep cold water. Five hours of waves crashing over the bow of the small boat that was her transportation made Jen really appreciate stepping onto the small beach area around the dock on Mona. A limestone island mostly surrounded by cliffs, the lower beach areas looked lushly tropical in her pictures, but the plateau on top of the cliffs was covered with sparse xeric plants and what looked like rocky soil. The contrast between the two habitats was amply illustrated by her pictures. While mentioning that pirates had apparently used the island, Jen flashed a picture of Johnny Depp as Captain Jack Sparrow on the screen and expressed her disappointment in not finding him or the supposed treasures buried on the island. She did find other interesting stuff, as illustrated by her pictures of the endemic anole and gecko, interspersed with photos of caves, spiders, bugs, and beautiful beaches.

Even though the the systematics and evolution of the genus *Eleutherodactylus* have been extensively studied, little is known about their natural history and biology, and of all the Puerto Rican *Eleutherodactylus*, *E. monensis* is probably the least known. The endemic frog is the only amphibian on the island. It is terrestial and is listed as vulnerable. Working with Dr. Joglar, Jen was on Mona to try and add to that limited knowledge. They worked in three sites covering a cave, a bromeliad quadrant on top of the plateau, and a well. Observations were focused on abundance, size, and reproduction of the frogs. Visual assessments were conducted day and night. Since this trip was in the dry season, most frogs were found in the caves and around the well, and virtually all frogs, since they are nocturnal, were found at night. We saw pictures of the sites, the frogs, and petroglyphs. A series of stills showed a coqui attacking and briefly seizing a gecko. The frogs are known to be fiercely territorial and Jen was enraptured by this demonstration of their boldness.

Because of her success in breeding other coquis, Jen had a permit to capture five males and five females to attempt captive breeding. She set up the animals in pairs with rain systems in a laboratory at the Albuquerque zoo. After losing all hatchlings from four clutches, she had the Albuquerque water tested. Even though she was filtering all water, a trace amount of naturally occurring fluoride was found. Once she switched to calcium enriched R.O. water, she's had total success and is now the proud provider for 58 tiny frogs. Beautiful Mona coqui hatchlings filled the screen and her affection for her charges was evident in Jen's voice as she described their color variability, huge appetite, and seemingly robust health. She commented on the Mona coquis' nest building as unique among the coquis that she has studied and had a series of slides from a night vision camera to illustrate that interesting behavior.

Jen had slides of the Albuquerque viewable laboratory, happy zoo visitors, cheerful steel drummers, and smiling restaurant owners to emphasis the importance of educating people about these animals. One of her successful innovations was a Puerto Rican night at a local Albuquerque restaurant. The restaurant was Mexican, but the owners were Puerto Ricans. Once a month they had dinner with bands and the frogs and souvenirs. It was a great success, heightening awareness and raising money to supplement her grants. One of the last slides showed a Mona Island iguana (*Cyclura cornuta stejnegeri*) standing on a beach, head held high. Jen described the lift she got every morning upon finding these majestic animals lining up on the beach to catch the sun's rays. She reveled in the absolute wildness encapsulated in the lizards' bold ownership of the island.

Jen Stabile is doing impressive conservation work. She delivered a presentation full of interest, humor, and enthusiasm and containing much more than I can write here, including news about Bd. She ended with pictures of her Mona Island team from Puerto Rico and encouraged us to view the website of Proyecto Coqui, the folks who have been doing coqui research for a long time. The site is in Spanish, but will soon be translated. In the meantime, Google translator does a fine job. She had pictures of her coworkers at the Albuquerque BioPark Zoo's Department of Herpetology. She encouraged us to attend the first meeting of Caribbean PARC in May. She invited us to visit in Albuquerque. She went to dinner with us after the meeting, bringing along a guest. She was just as interesting and fun at dinner as she was at the meeting. Her guest was interesting and fun. What a privilege to interact with someone of her talents. I feel sorry if you missed it.

And I started out unenthused.

Herpetology 2013

In this column the editorial staff presents short abstracts of herpetological articles we have found of interest. This is not an attempt to summarize all of the research papers being published; it is an attempt to increase the reader's awareness of what herpetologists have been doing and publishing. The editor assumes full responsibility for any errors or misleading statements.

SEED DISPERSAL BY CROCODILIANS

S. G. Platt et al. [2013, Journal of Zoology 291:87-89] note that saurochory (seed dispersal by reptiles) among crocodilians has largely been ignored, probably because these reptiles are generally assumed to be obligate carnivores incapable of digesting vegetable proteins and polysaccharides. They review the literature on crocodilian diet, foraging ecology, digestive physiology and movement patterns, and provide additional empirical data from recent dietary studies of *Alligator mississippiensis*. Evidence of frugivory was found in 13 of 18 (72.2%) species for which dietary information was available, indicating this behavior is widespread among the Crocodylia. Thirty-four families and 46 genera of plants were consumed by crocodilians. Fruit types consumed by crocodilians varied widely; over half (52.1%) were fleshy fruits. Some fruits are consumed as gastroliths or ingested incidental to prey capture; however, there is little doubt that on occasion, fruit is deliberately consumed, often in large quantities. Sensory cues involved in crocodilian frugivory are poorly understood, although airborne and waterborne cues as well as surface disturbances seem important. Crocodilians likely accrue nutritional benefits from frugivory and there are no a priori reasons to assume otherwise. Ingested seeds are regurgitated, retained in the stomach for indefinite and often lengthy periods, or passed through the digestive tract and excreted in feces. Chemical and mechanical scarification of seeds probably occurs in the stomach, but what effects these processes have on seed viability remain unknown. Because crocodilians have large territories and undertake lengthy movements, seeds are likely transported well beyond the parent plant before being voided. Little is known about the ultimate fate of seeds ingested by crocodilians; however, deposition sites could prove suitable for seed germination. Although there is no evidence for a crocodilian-specific dispersal syndrome similar to that described for other reptiles, this review strongly suggests that crocodilians function as effective agents of seed dispersal. Crocodilian saurochory offers a fertile ground for future research.

STATUS OF SEVERAL ENDEMIC MUD TURTLES

J. Reyes-Velasco et al. [2013, Chelonian Conservation and Biology 12(1):203-208] carried out surveys in northern and central Mexico to locate extant populations of *Kinosternon hirtipes chapalaense*, *K. h. magdalense*, and *K. h. megacephalum*, evaluate their conservation status, help establish captive breeding colonies of these taxa in the near future, and collect tissues for phylogenetic studies. During 2010 and 2011, the authors were able to locate extant populations of 2 of the subspecies (*K. h. chapalaense* and *K. h. magdalense*), but *K. h. megacephalum* could not be found. They also failed to locate natural springs in a radius of approximately 60 km from the type locality (and only known locality) of *K. h. megacephalum* and believe that this turtle is extinct.

NO CHYTRID IN PRESERVED GOLDEN TOADS

K. L. Richards-Hrdlicka [2013, J. Herpetology 57(3):456-458] notes that the golden toad (*Cranopsis periglenes*) of Monteverde, Costa Rica, is arguably the "poster child" for the global amphibian decline crisis. Of the known drivers of amphibian declines, it has been hypothesized that the emerging infectious disease, chytridiomycosis, caused by the fungal pathogen, *Batrachochytrium dendrobatidis* (Bd), led to the toad's extinction. The aim of this study was to test whether the last collected and curated *C. periglenes* specimens were infected with Bd. Fifteen preserved *C. periglenes*, three of which were the last ever collected (April 1982), were swabbed for the presence of Bd. All skin swabs were tested for Bd with a specific qPCR assay and found negative for Bd. Either the zoospore loads from the specimens fell below detection limits, or the tested specimens were not exposed to Bd at the time of collection. This study highlights the importance of collecting noninvasive, field swabs from living amphibians even those facing decline.

SALINITY TOLERANCE AMONG TADPOLES

M. E. Brown and S. C. Walls [2013, Copeia 2013(3):543-551] note that amphibians in freshwater coastal wetlands periodically experience acute exposure to salinity from hurricane-related overwash events, as well as chronic exposure associated with rising sea levels. In a comparative experimental approach, the authors examined whether seven species of anuran amphibians vary in their tolerance to changes in salinity. In a laboratory study, they exposed larval *Hyla cinerea* (green treefrogs), *H. squirella* (squirrel treefrogs), *Lithobates catesbeianus* (American bullfrogs), *L. sphenocephalus* (southern leopard frogs), *Anaxyrus terrestris* (southern toads), and *Gastrophryne carolinensis* (eastern narrow-mouthed toads) from an inland population in north central Florida, and *Osteopilus septentrionalis* (Cuban treefrog) from an inland population in southwest Florida, to acute salinity for 72 h. For each species, trials were replicated in which tadpoles were exposed to salinities of 0.2 (control), 5, 10, 12, 14, and 16 ppt. For all species, tadpoles reared in the control and 5 ppt treatments had 96.7–100% survival. No *G. carolinensis* survived at salinities exceeding 5 ppt and no individuals of any species survived in the 14 or 16 ppt treatments. For all other native species, survival at 10 ppt ranged from 46.7 to 80%, but declined to 0% at 12 ppt (except for *H. cinerea*, of which only 3.3% survived at 12 ppt). In contrast, all individuals of the invasive, non-native *O. septentrionalis* survived exposure to a salinity of 10 ppt, and survival in this species remained relatively high at 12 ppt. These results illustrate that the non-native *O. septentrionalis* has higher salinity tolerance than the native species tested, which may contribute to its invasion potential. Moreover, species commonly associated with coastal freshwater wetlands differ in salinity tolerances, suggesting that salt water intrusion due to storm surges and sea level rise may affect the species composition of these ecosystems.

DO COTTONMOUTHS BASK IN TREES?

S. P. Graham [2013, J. Herpetology 57(3):428-431] notes that a common belief in the southeastern United States is that cottonmouths (*Agkistrodon piscivorus*) bask frequently in tree branches over the water's edge and are therefore of considerable hazard for anglers and boaters. Although this notion is almost certainly based upon observations of nonvenomous watersnakes (*Nerodia* spp.), there are no quantitative data that specifically address this belief. The author analyzed a 7-yr dataset on cottonmouths from two populations (Georgia and Alabama) to determine the frequency of this behavior by cottonmouths. Behavioral and substrate information were recorded for 804 separate observations on cottonmouths. Only two of the cottonmouths were exhibiting arboreal behavior (0.25% of observations)—snakes observed over the ground or water surface on branches narrower than their own bodies—confirming that this is indeed a very rare tendency in this species and not likely to be observed by the public. Instead, cottonmouths were frequently encountered on the ground along the water's edge in their characteristic ambush posture, uncoiled in aquatic situations, or coiled on elevated platforms (e.g., hummocks, piles of driftwood, logs, beaver lodges). This study demonstrates that cottonmouths have the capacity to climb but are not likely to be observed in arboreal situations.

SURVEYING CRAWFISH FROGS

P. J. Williams et al. [2013, Copeia 2013(3):552-561] note that crawfish frogs (*Lithobates areolatus*) are a relatively widespread but under studied North American species suspected to be in steep decline. Discussions to petition this species for federal listing have begun and therefore effective techniques to survey and monitor populations must be developed. Crawfish frogs produce unusually loud breeding calls, making call surveys the most efficient way to assess populations; however, their peak breeding period lasts for only a few nights, sometimes for only one night. Automated calling survey techniques were used at two wetlands where the numbers of crawfish frog males present were known (±1%) for the entire length of the breeding season to examine detection probabilities in relation to season, time of day, weather variables, survey duration, and the numbers of males present. These data were then used to answer three simple but important questions: 1) When should researchers listen—that is, what times and under what environmental conditions should surveys for crawfish frogs take place? 2) How long should surveys last? and 3) What can call surveys tell us about the size of a population? The most supported model for detection included the quadratic relationship of time and date, a positive linear relationship with temperature, and a negative linear relationship with recent rain, while the most supported model for estimating abundance included the quadratic relationship of time and date, and call rate. Five-minute surveys should suffice during peak breeding for known large populations; 15-minute surveys with repeat visits should be used for small populations or when sampling new areas. These findings should improve manually collected (auditory) call survey efficiencies for crawfish frogs, surveys that are being organized to provide the first objective data on the status of this species across its range.

HYBRIDIZATION BETWEEN GARTERSNAKE SPECIES

J. M. Kapfer et al. [2013, J. Herpetology 57(3):400-405] note that snakes within the genus *Thamnophis* (gartersnakes and ribbonsnakes) are often found in sympatry throughout their geographic distributions. Past work has indicated that some sympatric species within this genus may hybridize, but research of this nature is limited. The authors attempted to determine whether hybridization occurs between two *Thamnophis* species native to the upper midwestern United States: common gartersnakes (*Thamnophis sirtalis*) and the Butler's gartersnakes (*Thamnophis butleri*). They sampled snakes ($n = 411$) across 26 locations in Wisconsin, including sites where both species coexist and sites where only common gartersnakes are found. They conducted genetic analyses on tissue collected from individuals field-identified as common gartersnakes or Butler's gartersnakes. To verify the results of the field-collected data, tissues were analyzed from juvenile snakes ($n = 4$) suspected to be the offspring of a common gartersnake and a Butler's gartersnake that were housed together in a captive situation. Of the field-collected snakes analyzed, eight snakes were consistent with expected common × Butler's gartersnake hybrids. All four of the captive offspring analyzed resolved as putative hybrids, corresponding with the field-collected samples. Butler's gartersnake is a globally rare species, endemic only to the upper midwestern United States. Studies involving the potential for hybridization between common and uncommon species are useful from a conservation perspective. The low incidence of hybridization observed would indicate that hybridization between these species is uncommon. Further research investigating rates of hybridization would help assess any potential threat posed by outbreeding between common and rare gartersnakes in this region of the United States.

HOG-NOSED SNAKES AVOID PAVED ROADS

L. E. Robson and G. Blouin-Demers [2013, Copeia 2013(3): 507-511] note that roads can directly impact animal populations by increasing the risk of mortality; however, a more subtle ecological effect may lie in the way roads impede gene flow by creating barriers to animal movement. The authors investigated the effect a road network, containing both paved and unpaved surfaces, has on the movement patterns of eastern hog-nosed snakes (*Heterodon platirhinos*) in the Long Point region of Ontario, Canada by radio-tracking 17 adult snakes over two years. They used telemetry data collected in the field to infer the minimum number of road crossings made by snakes, and random walk simulations to estimate the number of road crossings snakes would have made if they moved randomly in relation to roads. Comparing the inferred and expected number of crossings allowed the authors to test the hypothesis that roads constrain movements because snakes avoid crossing them. Overall, the road network did not impede snake movements. Examined separately, however, road substrates affected movement: snakes avoided crossing paved roads while they crossed sand roads readily. Male and female snakes crossed roads at the same frequency. While the risk of road mortality is reduced by road avoidance, such avoidance of paved roads may contribute to the genetic isolation and further decline of this species-at-risk.

WATERSNAKES IN CALIFORNIA

J. P. Rose et al. [2013, J. Herpetology 57(3):421-427] report that northern watersnakes, *Nerodia sipedon*, have been introduced into California's Central Valley and pose an important new challenge for the management of biodiversity in the state's already greatly distressed freshwater ecosystems. Nonnative watersnakes will likely compete with federally threatened giant gartersnakes, *Thamnophis gigas*, and prey on native amphibians and fish, including young salmonids, many of which are imperiled. Three types of aquatic funnel traps and three different methods were used to estimate the abundance and density of *N. sipedon* in a small wetland in Roseville, California. Capture rates did not differ significantly among the three trap types but snakes captured in large box funnel traps were nearly 300 mm longer on average than those captured in minnow traps. Estimates of the abundance of *N. sipedon* in the 2-ha trapping area were similar for the mark–recapture model, Leslie depletion curve, and the actual number of snakes removed over 57 days (112.4–119 individuals; approximately 56.2 snakes/ha). Extrapolating to the entire 6.2-ha aquatic area, the population likely numbered approximately 348 individuals. Several females were gravid, demonstrating successful reproduction by this species outside its native range. Captured snakes included more small *N. sipedon* compared with studies in its native range. This may be due to a sampling bias in trapping methods but more likely reflects a population growing rapidly from a few initial founders with relatively fewer large adults. The authors recommend immediate action to prevent the spread and broader establishment of *N. sipedon* across the Central Valley of California.

MAP TURTLE DIETS

T. Richards-Dimitrie et al. [2013, Copeia 2013(3):477-484] note that alterations of flow regimen, pollution, and introductions of exotic species have significantly altered the composition of invertebrates in many river systems throughout the world. How these alterations affect the diet of higher level predators is not well understood. The authors studied the diet of northern map turtles (*Graptemys geographica*) in the dam-regulated Susquehanna River in north-central Maryland. Northern map turtles are a relatively large, top-order predator that is legally endangered in the state and is impacted by commercial collecting elsewhere. Gastropods, trichopteran larvae, and invasive clams (*Corbicula* sp.) predominated across diet samples. Marked sexual and size-related differences occurred. Adult male *G. geographica* fed primarily on a group of small gastropod species (Planorbidae, Hydrobiidae, Physidae), trichopterans, and *Corbicula*, while adult females fed primarily on pleurocerid snails. There was virtually no overlap in the diets of the two sexes of *G. geographica*. This is of special conservation concern because two different groups of prey are needed in order to support this population of northern map turtles, and many North American pleurocerid gastropod species are highly endangered and also threatened by hydroelectric activity. These results are consistent with reports of other map turtle populations before the invasion of zebra mussels (*Dreissena* sp.), which often result in a sharp change in diet. Zebra mussels have already been documented immediately upstream of our study site, so impacts from this invasive species may become apparent in the near future.

LEAPING SALAMANDERS

W. G. Ryerson [2013, Copeia 2013(3):512-516] studied jumping in the Ocoee salamander, *Desmognathus ocoee*. Individuals were persuaded to jump five times over a 5-cm gap by tapping metal forceps directly behind the individual. Unlike most terrestrial vertebrates, which use force generated from the hind limbs to jump, salamanders jump by laterally bending and then rapidly straightening the body, using momentum to carry the individual through the air. This movement is strikingly similar to both the terrestrial escape response of mudskippers and terrestrial blennies, and shares a general pattern of movement with the C-start escape response in several aquatic vertebrates. While the axial musculature appears to be responsible for this behavior, it remains to be seen what role the limbs and tail play. Across a twofold range in body sizes, few kinematic parameters were correlated with size. The lack of strong scaling relationships suggests a spring mechanism that allows performance to be maintained despite a twofold increase in size.

DICHROMATISM IN NORTHERN MAP TURTLES

G. Bulté et al. [2013, Chelonian Conservation and Biology 12(1):187-192] note that sexual dichromatism is common in many animal taxa, but little quantitative information on sexual dichromatism is available for turtles. The authors quantified sexual dichromatism in the postorbital spots of northern map turtles (*Graptemys geographica*) using reflectance spectrometry and examined the relationship between postorbital spot coloration and circulating testosterone among males. The coloration of postorbital spots was found to differ between the sexes, with adult males exhibiting brighter spots than adult females. However, adult males and juvenile females did not exibit siginficant differences in coloration, and testosterone levels did not explain the variation in postorbital spot coloration among males.

OVIPOSITION SITES OF SPOTTED SALAMANDERS

M. M. Kern et al. [2013, J. Herpetology 57(3):445-449] note that oviposition site selection is an important aspect of reproduction for species such as amphibians that breed in dynamic environments. They examined predictors of oviposition site selection of spotted salamanders (*Ambystoma maculatum*) at Cowan's Ford Wildlife Refuge in Mecklenburg County, North Carolina. They conducted egg mass surveys and checked 40 minnow traps for potential predators every 2 days along transects, sampling a subset of all representative habitat within the wetland. Random points were generated for each egg mass to compare microhabitat conditions in areas where egg masses were present versus undetected. Statistical methods were used to rank the associations between oviposition site and water depth, temperature, predator density, and vegetation. *Ambystoma maculatum* egg mass location was best predicted by deeper water and denser submergent vegetation. The results suggest that *A. maculatum* select oviposition sites actively, rather than ovipositing in all available microhabitat, implying that vegetation structure and hydrology of ephemeral wetlands are important for the successful reproduction of this species.

Unofficial Minutes of the CHS Board Meeting, October 18, 2013

The meeting was called to order at 7:45 P.M. at the Schaumburg Public Library. Board members Josh Baity and Cindy Steinle were absent.

Officers' Reports

Recording Secretary: The minutes of the September 13 board meeting were read, discussed and accepted.

Treasurer: The September treasurer's report was given, discussed, and accepted.

Membership Secretary: Numbers are holding at just under 500. The list of expiring memberships was read.

Vice-president: Cindy Steinle was absent. The holiday meeting, to be held on Thursday, December 26, was discussed. Mike Dloogatch moved to allocate $200 for food at the holiday party, Aaron LaForge seconded, the motion passed unanimously. Stephanie Cappiello will be organizing the refreshments.

Corresponding Secretary: Stephanie has been having problems with the phone. She is working on resolving the issues.

Publications Secretary: Aaron has updated the Grants page to announce the 2014 program.

Committee Reports

Shows:
- Notebaert Nature Museum, first full weekend of each month.
- 3-in-one Expo, Arlington Park Racetrack, November 9–10.
- SEWERFest, November 10.

Old Business

Junior Herpers: Cards will be printed with the dates for next year's meetings. Rich Lamzsus is working on name badges for staff and kids. Discussion about membership cards and coloring sheets led to the need for more operating cash. Jenny moved to allocate $300 for the running of Junior Herpers for the next 6 months. Jim seconded, the motion passed unanimously.

Nominating Committee: The slate is ready for the elections in November.

Web Site Update: Barbara Nieri Hood is working on the update.

Salamander Safari: Jason is looking into possible locations.

CHS 50th Anniversary: Dick Buchholz thinks he can get a donation of an articulated alligator skeleton for the Midwest Herpetological Symposium auction

New Business

Symposium Sponsorship: The Hoosier Herp Society is looking for sponsors for the MHS next year. $100 puts a logo on the symposium T-shirt. Mike Dloogatch will look into this.

NARBC: Andy will write reimbursement checks for those who worked the CHS booth at NARBC and paid the entrance fee.

December board meeting: The Malawys will again host the December board meeting. Aaron moved to allocate $200 for refreshments, Jenny seconded, and the motion passed unanimously.

Round Table

Rich Lamzsus adopted a Mexican black kingsnake, bred it and successfully hatched babies.

Mike Scott got two new snakes at NARBC.

Aaron got pink-tongued skinks at NARBC.

John Archer had patches made with the CHS logo. He can get more, or have shirts embroidered with the logo. He will offer them at the next meeting.

Dick Buchholz commended John for the patches. Dick explained how he got a new hedgehog through Bob from animal control. Happy birthday, Dick!

Barbara is really proud of the Junior Herp Society and the staff!

The meeting was adjourned at 9:22 P.M.

Respectfully submitted by recording secretary Jenny Vollman

News and Announcements

FUNDING AVAILABLE FOR PRAIRIE RESEARCH

Prairie Biotic Research (PBR) is an all-volunteer nonprofit that fosters basic biotic research in prairies and savannas. PBR funds grants up to $1000 to individuals for the study of any grassland taxon anywhere in the USA. They support both natural history and experimental science, and are especially eager to support independent researchers (those lacking institutional support), but anyone may apply. Since 2002, they've awarded 155 grants worth $148,946 to people in 32 states. Many of these grants supported graduate student research.

In 2014, at least 10 grants of up to $1000 each will be funded by PBR, including some restricted by donors to support research in IA, IL, MI, MN, ND, SD and WI. Visit prairiebioticresearch.org to learn more. Check out the history and overview files in the Small Grants section of the website to see what sorts of proposals have won funding in the past.

Those who won funding in 2013 are ineligible for this funding in 2014, but those who won funding longer ago are welcome to submit proposals to further that same work or to support a new project. You must have a U.S. Social Security number to apply and the research for which you seek support must be done in the USA. Proposals are due by December 31, 2013.

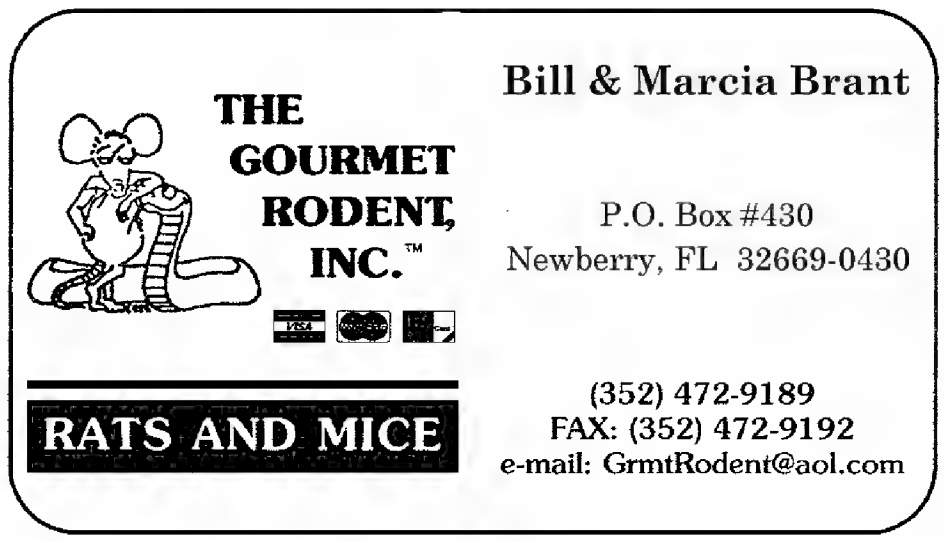
Advertisements

For sale: rats and mice—pinkies, fuzzies and adults. Quantity discounts. Please send a SASE for pricelist or call Bill Brant, *THE GOURMET RODENT*, PO Box 430, Newberry, FL 32669-0430, 352-472-9189, E-mail: GrmtRodent@aol.com.

For sale: **highest quality frozen rodents**. I have been raising rodents for over 30 years and can supply you with the highest quality mice available in the U.S. These are always exceptionally clean and healthy with no urine odor or mixed in bedding. I feed these to my own reptile collection exclusively and so make sure they are the best available. All rodents are produced from my personal breeding colony and are fed exceptional high protein, low fat rodent diets; no dog food is ever used. Additionally, all mice are flash frozen and are separate in the bag, not frozen together. I also have ultra low shipping prices to most areas of the U.S. and can beat others shipping prices considerably. I specialize in the smaller mice sizes and currently have the following four sizes available: Small pink mice (1 day old—1 gm) , $25 /100; Large pink mice (4 to 5 days old—2 to 3 gm), $27.50 /100; Small fuzzy mice (7 to 8 days old—5 to 6 gm) , $30/100; Large fuzzy mice / hoppers (10 to 12 days old—8 to 10 gm), $35/100 Contact Kelly Haller at 785-234-3358 or by e-mail at kelhal56@hotmail.com

For sale: High quality, all locally captive-hatched tortoises, all bred and hatched here in the upper midwest. Baby leopards, Sri Lankan stars, and pancakes usually available, and are all well-started and feeding great! Leopards are $125 ea., Sri Lankans (2012 hatched) $475 ea. And Pancakes are $195 ea. Leopards for out of state sale/shipping require a veterinary health certificate (inquire for cost). E-mail at KKranz1@wi.rr.com or call Jim or Kirsten at 262 654 6303.

Herp tours: **Costa Rica herping adventures**. Join a small group of fellow herpers for 7 herp-filled days. We find all types of herps, mammals, birds,and insects, but our target is snakes. We average 52 per trip, and this is our 10th year doing it. If you would like to enjoy finding herps in the wild and sleep in a bed at night with air-conditioning, hot water and only unpack your suitcase once, instead of daily, then this is the place to do it. Go to our web-site http://hiss-n-things.com and read the highlights of our trips. Read the statistics of each trip and visit the link showing photos of the 40 different species we have found along the way. E-mail at jim.kavney@gmail.com or call Jim Kavney, 305-664-2881.



Line ads in this publication are run free for CHS members—$2 per line for nonmembers. Any ad may be refused at the discretion of the Editor. Submit ads to mdloogatch@chicagoherp.org.

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UPCOMING MEETINGS

The next meeting of the Chicago Herpetological Society will be held at 7:30 P.M., Wednesday, November 27, at the Peggy Notebaert Nature Museum, Cannon Drive and Fullerton Parkway, in Chicago. This meeting will include the annual election of officers and members-at-large of the CHS board of directors. Also at this meeting **Stephen L. Barten, D.V.M.**, will speak about field herping in southern Illinois, Wisconsin and southwest Texas.

The December meeting will be a holiday party. Because the last Wednesday is Christmas Day this party will take place on Thursday evening, December 27. The CHS will provide soft drinks and snacks. If you would like to bring something edible to share with the group, you are invited to do so. If you would like to bring an animal to show off to the group, you are encouraged to do that as well. This will be a chance to socialize all evening and get to know your fellow members a little better.

The regular monthly meetings of the Chicago Herpetological Society take place at Chicago's newest museum—the **Peggy Notebaert Nature Museum**. This beautiful building is at Fullerton Parkway and Cannon Drive, directly across Fullerton from the Lincoln Park Zoo. Meetings are held the last Wednesday of each month, from 7:30 P.M. through 9:30 P.M. Parking is free on Cannon Drive. A plethora of CTA buses stop nearby. Free parking is available in the walled-in area to the south of the loading dock ramp.

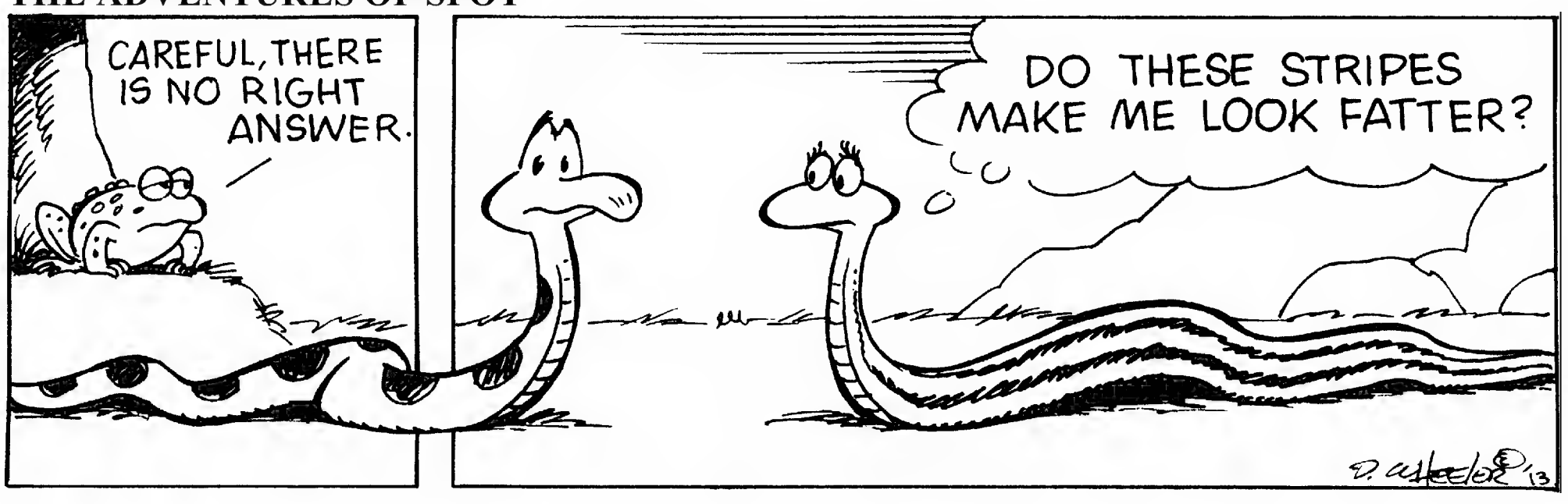
Board of Directors Meeting

Are you interested in how the decisions are made that determine how the Chicago Herpetological Society runs? And would you like to have input into those decisions? If so, mark your calendar for the next board meeting, to be held at 7:30 P.M., December 13, at the home of Linda and Andy Malawy in Naperville. If you wish to attend, please call Linda at (630) 717-9955.

The Chicago Turtle Club

The monthly meetings of the Chicago Turtle Club are informal; questions, children and animals are welcome. Meetings normally take place at the North Park Village Nature Center, 5801 N. Pulaski, in Chicago. Parking is free. For more info visit the group's Facebook page.

THE ADVENTURES OF SPOT



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BULLETIN
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The Relative Importance of Slugs and Earthworms in the Diet of Dekay's Brownsnake, *Storeria dekayi*, from Northwestern Pennsylvania . . . . . Brian S. Gray 157

Notes on the Distribution of *Scaphiopus holbrookii* in Maryland . . . . . Robert W. Miller 166

What You Missed at the November Meeting . . . . . John Archer 172

Unofficial Minutes of the CHS Board Meeting, November 15, 2013 175

Index to Scientific Names of Amphibians and Reptiles for Volume 48 (2013) 176

Author–Title Index for Volume 48 (2013) 177

Advertisements 180

Cover: Green sea turtle, *Chelonia mydas*, at the Grand Cayman Turtle Farm. Photograph by Stephen L. Barten, D.V.M

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The Chicago Herpetological Society is a nonprofit organization incorporated under the laws of the state of Illinois. Its purposes are education, conservation and the advancement of herpetology. Meetings are announced in this publication, and are normally held at 7:30 P.M., the last Wednesday of each month.

Membership in the CHS includes a subscription to the monthly *Bulletin*. Annual dues are: Individual Membership, $25.00; Family Membership, $28.00; Sustaining Membership, $50.00; Contributing Membership, $100.00; Institutional Membership, $38.00. Remittance must be made in U.S. funds. Subscribers outside the U.S. must add $12.00 for postage. Send membership dues or address changes to: Chicago Herpetological Society, Membership Secretary, 2430 N. Cannon Drive, Chicago, IL 60614.

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The Relative Importance of Slugs and Earthworms in the Diet of Dekay's Brownsnake, *Storeria dekayi*, from Northwestern Pennsylvania

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Abstract

The diet of Dekay's brownsnake, *Storeria dekayi*, was studied by examining 84 fecal samples from 74 snakes. Remains of slugs (i.e., shells, jaws, and radulae) were present in 47 (56%) samples; while earthworm setae were found in 6 (7%). Seven (8%) additional samples contained both slug and earthworm remains. Fourteen samples lacked any identifiable slug or earthworm remains. Proportions of prey were similar between sexes and between age classes. Among female *S. dekayi*, larger individuals consumed, on average, larger prey than smaller individuals, such a trend was lacking in males. In addition, incidental food items are documented, as well as a method for estimating prey size (i.e., slug length and mass) from shells found in scats.

Introduction

Dekay's brownsnake, *Storeria dekayi* (Figure 1), is a small natricine snake found throughout much of the eastern United States and Canada. Rossman and Meyer (1990) suggested that the dentition of *S. dekayi* may be adapted to feeding on slugs, and that these snakes are also capable of extracting snails from their shells. The diet of *S. dekayi* in Pennsylvania is reported to consist primarily of slugs and earthworms (Hulse et al., 2001). Within Pennsylvania, diet appears to vary geographically, with slugs being predominant in the northwest (Gray, 2013; Gray, in press), while Ernst (2003) found earthworms to be the primary prey at two southeastern Pennsylvania sites. Such variation in diet also exists in other parts of the species' range. For example, in Indiana and Ontario, slugs are primarily consumed (Judd, 1954; Catling and Freedman, 1980; Minton, 2001); while in Maryland, Illinois, and Kansas, earthworms are predominant as prey (Kelly et al., 1936; Smith, 1961; Pisani, 2009). Other reported food items of *S. dekayi* include soft-bodied insect larvae, snails, small frogs, amphibian eggs, small fish, and sow bugs (Wright and Wright, 1957; Oldfield and Moriarty, 1994).

The use of regression analysis has been used to estimate prey size and numbers from prey remains found in snakes (Godley et al., 1984), birds, and mammals (Fowler et al., 1998). In particular, Fowler et al. (1998) described the use of fish otoliths found in seal and seabird droppings or regurgitates to estimate fish length and mass. Godley et al. (1984) used crayfish gastroliths to estimate the size and number of crayfish consumed by snakes in the genus *Regina*. Such methods have several advantages over sacrificing animals for dissection, or forced regurgitation to study diet. First, fecal material is easily obtained from snakes during routine handling without causing too much undue stress. The snake does not have to be sacrificed to obtain a fecal sample. In addition, forcing gravid females to regurgitate prey items may cause harm to the female or her developing offspring. Once a snake regurgitates a food item, it may not re-swallow it, thus causing it to lose much needed energy and nutrients.

Figure 1. Dekay's brownsnake, *Storeria dekayi*, Erie County, Pennsylvania.

The purpose of this study was to examine fecal samples from free-living *S. dekayi* to better understand the relative importance of slugs and earthworms in the diet. I also used regression analysis to estimate prey size and numbers from prey remains found in fecal samples.

Materials and Methods

Man-made debris (e.g., tar paper, wooden panels, and linoleum) along a vegetated slope in northwest Pennsylvania were searched for *S. dekayi* between March and September 2012, and March and August 2013. A description of the site and natural history of the population of *S. dekayi* is provided in Gray (in press). Snakes were hand-captured, sexed, and their snout–vent length (SVL) and tail length measured to the nearest millimeter. Mass for each snake was obtained with a spring scale accurate to 0.1 g. As per Hulse et al. (2001), males that were at least 175 mm SVL, and females that were at least 220 mm SVL, were considered to be mature; those smaller than the respective values were classified as juveniles. A portable cautery unit was used to individually mark each snake (Winne et al., 2006).

Fecal samples (n = 80) were collected from 74 *S. dekayi* by holding the vent of each snake directly over a vial containing 70% isopropyl alcohol. A label containing the snake's ID num-

Figure 2. Slug shell and oxygnathous jaws (20× magnification) found in a *Storeria dekayi* fecal sample.

Figure 3. Earthworm setae (50× magnification) found in a *Storeria dekayi* fecal sample.

ber and the date was placed in each vial. Samples were later placed in a petri dish with tap water and examined with a dissecting microscope at 10× and 30× magnifications. Four additional fecal samples were collected directly in petri dishes and examined for live parasites. Slug shells, jaws and radulae, and earthworm setae were noted if found. Slug shell length (SL) was measured medially along the long axis; slug jaw width (JW) was measured at its widest point. Both SL and JW were measured to the nearest 0.1 mm using a BioQuip® Miniscale. Measurements of SL only included the calcified portion of the shell, as the periostracum in some instances was damaged. I performed *G*-tests to determine whether proportions of slugs and earthworms in the diet differed significantly between snake age classes and between sexes. I used Student's *t*-tests (two-tailed) to compare differences between means. Prior to performing *t*-tests, an *F*-test was used to determine whether variances were homogenous. In the event variances were heterogeneous, a *t*-test assuming unequal variances was employed. I used linear regression analysis and analysis of variance (ANOVA) to examine the relationship between snake SVL and prey size (i.e., SL). With the exception of *G*-tests, for which a calculator was used, data analysis was performed using Microsoft Excel 2010. Alpha was set at 0.05 for all tests.

The following assumptions were made to justify estimating prey size from slug remains, and are similar to those given in Godley et al. (1984). Specifically, I assumed: 1) *Storeria dekayi* feed primarily on slugs. 2) Slug shells (jaws and radulae) are not digested. 3) Slug shell length increases directly with slug body length. 4) Slug shells (jaws and radulae) are easily acquired from fecal samples of *S. dekayi*.

For the estimation of prey size (BL and mass) from SL, slugs, *Deroceras reticulatum* (n = 25) were collected from the study site, drowned in tap water, then subsequently placed in 50% isopropyl for 24 h, then 70% isopropyl for another 24 h. Body length (BL) of slugs were measured to the nearest 0.1 mm with dial calipers. Slug mass was obtained with a digital scale to the nearest 0.01 g. Only 19 *D. reticulatum* were available for measurements of mass. Slug shells were dissected out and SL measured to the nearest 0.1 mm with a BioQuip® Miniscale. I used regression analysis to estimate slug BL and mass from SL.

Results

Prey remains were found in 60 of 84 fecal samples: 47 with slug remains (Figure 2), six with earthworm setae (Figure 3), and seven with both slug and earthworm remains. Slug shells (n = 80) were asymmetrical with the nucleus located laevo-posteriorly, and were characteristic of those in the family Limacidae (Reuse, 1983). The majority of the jaws (n = 41) observed were smooth with a median anterior projection (oxygnathous) and typical of the Limacidae. Two crescent-shaped, ribbed (odontognathous) jaws, characteristic of the Arionidae, were also found. Male *S. dekayi* contained 1 or 2 radulae, 1–3 shells, and 1 or 2 jaws; females contained 1–5 radulae, 1–8 shells, and 1–7 jaws (Figures 4, 5 and 6). Proportions of slugs, earthworms, and both slugs and earthworms in fecal samples were not statistically different ($G = 0.75$, $df = 2$, $P > 0.05$) between males and females (Table 1). Proportions of slugs, earthworms, and both slugs and earthworms in fecal samples were not statistically different ($G =$

Table 1. Frequencies of slug, earthworm, and both slug and earthworm remains found in fecal samples from male and female *Storeria dekayi*.

	Prey remains			
	Slug	**Earthworm**	**Both**	**Totals**
Males	25	4	3	32
Females	22	2	4	28
Totals	47	6	7	60

Table 2. Frequencies of slug, earthworm, and both slug and earthworm remains found in fecal samples from juvenile and adult *Storeria dekayi*.

	Prey remains			
	Slug	**Earthworm**	**Both**	**Totals**
Juveniles	17	1	3	21
Adults	30	5	4	39
Totals	47	6	7	60

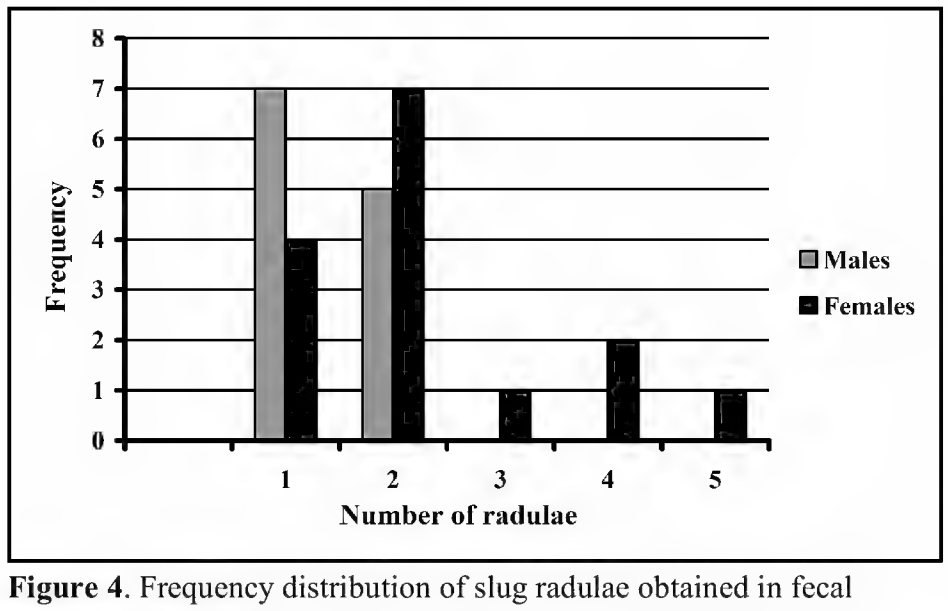

Figure 4. Frequency distribution of slug radulae obtained in fecal samples from male (n = 12) and female (n = 15) *Storeria dekayi*.

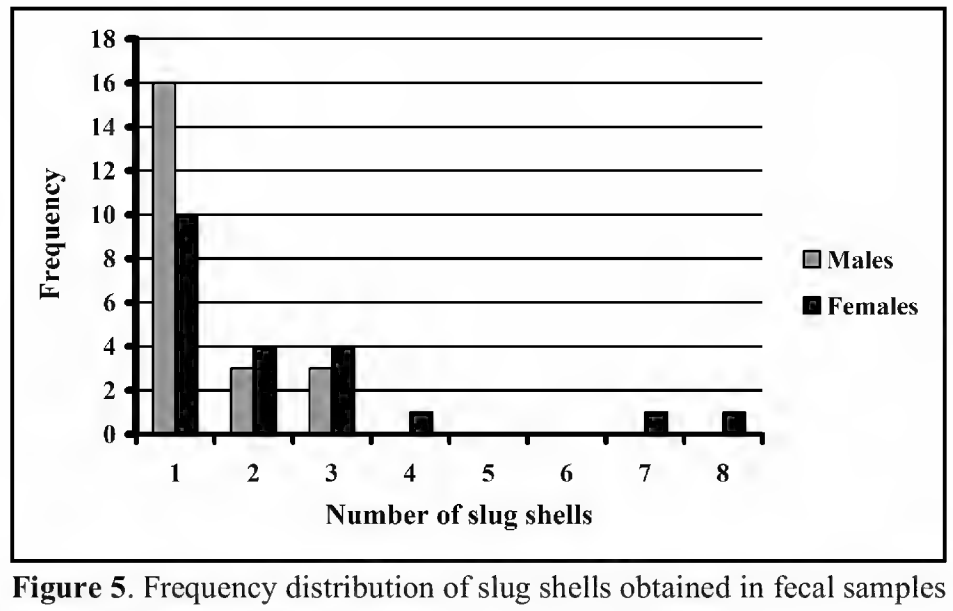

Figure 5. Frequency distribution of slug shells obtained in fecal samples from male (n = 22) and female (n = 21) *Storeria dekayi*.

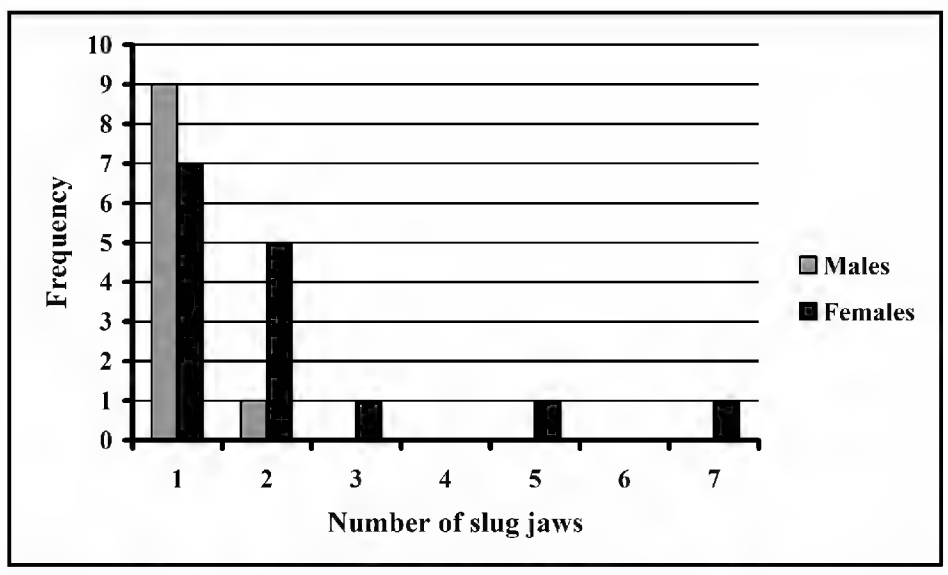

Figure 6. Frequency distribution of slug jaws obtained in fecal samples from male (n = 10) and female (n = 15) *Storeria dekayi*.

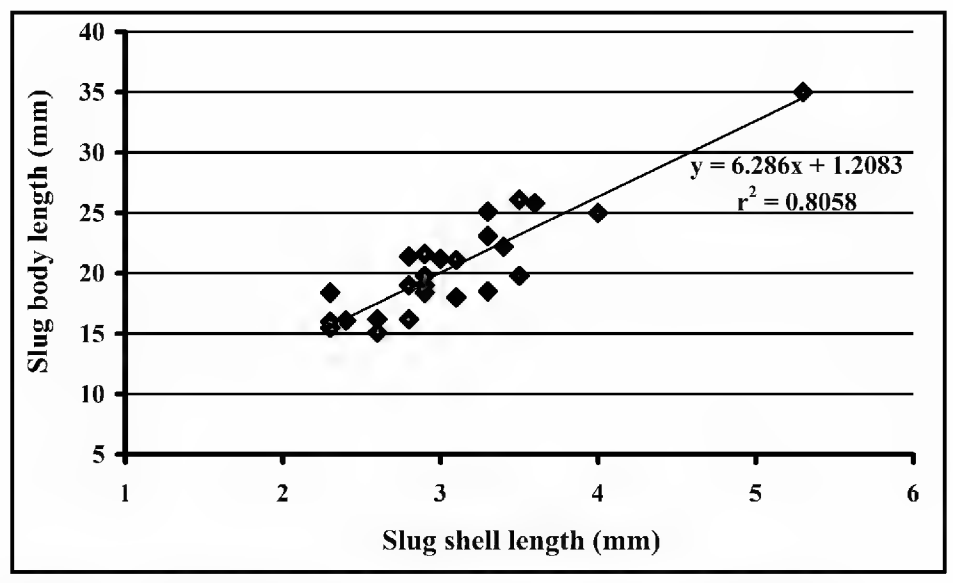

Figure 7. Relationship of slug shell length to slug body length for *Deroceras reticulatum* (n = 25).

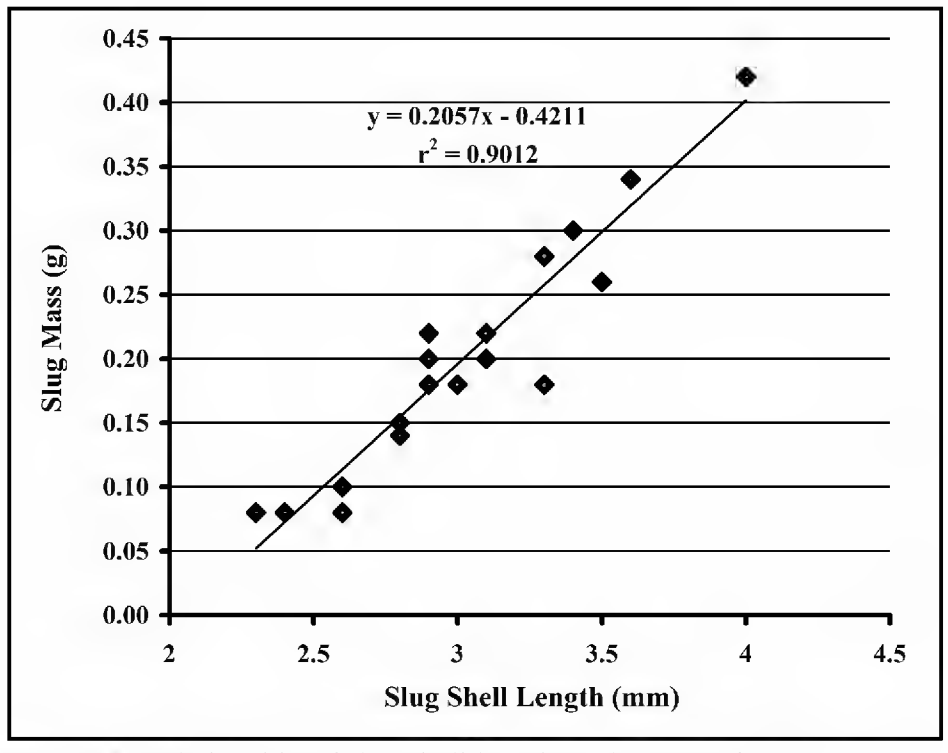

Figure 8. Relationship of slug shell length to slug mass for *Deroceras reticulatum* (n = 19).

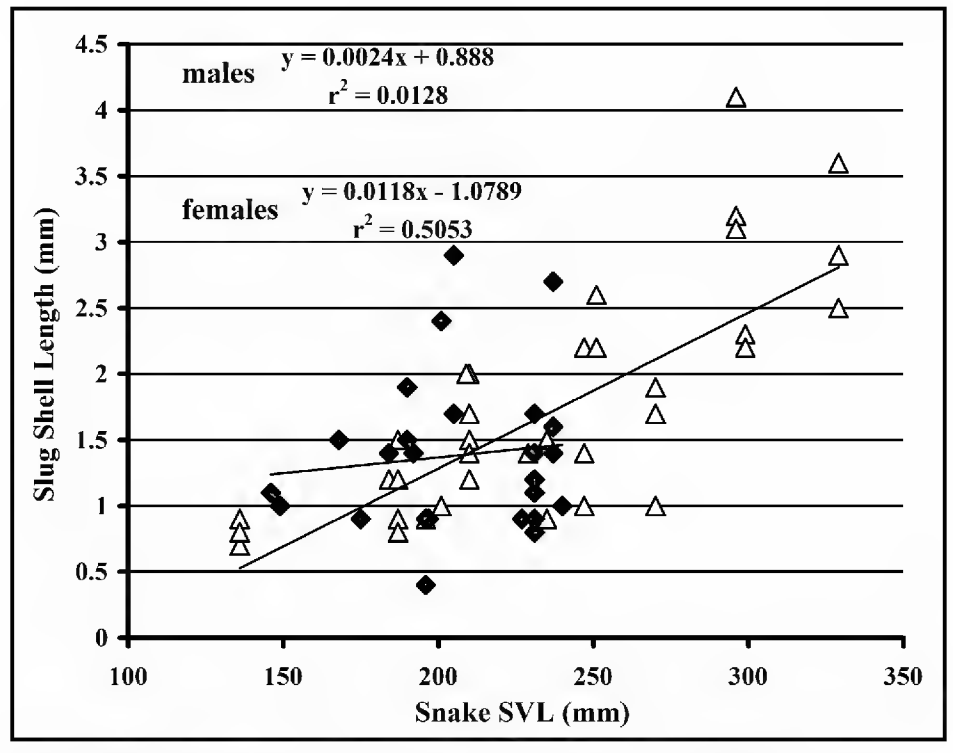

Figure 9. Relationship of *Storeria dekayi* snout–vent length to slug (*Deroceras reticulatum*) shell length. Male *S. dekayi* (n = 25) are represented by solid diamonds; female *S. dekayi* (n = 43) are represented by open triangles.

1.21, $df = 2$, $P > 0.05$) between juveniles and adults (Table 2).

Slug SL was strongly correlated to BL ($r = 0.90$) and this correlation was significant (ANOVA $F = 95.42$, $df = 1, 23$, $P < 0.001$) (Figure 7). The regression equation: y = 6.286x + 1.2083 was used to estimate maximum slug BL from shells obtained in fecal samples. Estimated maximum BL was 27 mm. Slug SL was strongly correlated to mass ($r = 0.95$) and the correlation was significant (ANOVA $F = 155.15$, $df = 1, 17$, $P < 0.001$) (Figure 8). The regression equation: y = 0.2057x - 0.4211 was used to estimate maximum slug mass from shells obtained in fecal samples. Estimated maximum mass was 0.42 g. There was no significant difference ($t = -1.50$, $df = 61$, $P = 0.138$) between the length of slug shells found in samples from male (mean = 1.4 ± 0.2 mm, range 0.8–2.9, n = 24) and female (mean = 1.7 ± 0.2 mm, range 0.7–4.1, n = 43) *S. dekayi*. The correlation between male SVL and SL was very weak ($r = 0.11$) and not significant (ANOVA $F = 0.30$, $df = 1, 23$, $P = 0.59$) (Figure 9). Female SVL and SL were positively and significantly correlated ($r = 0.71$) (ANOVA $F = 41.88$, $df = 1, 41$, $P < 0.01$) (Figure 9). There was a significant difference ($t = -2.74$, $df = 65$, $P = 0.008$) between the length of slug shells found in samples from juvenile (mean = 1.3 ± 0.2 mm, range 0.7–2.0, n = 23) and adult (mean = 1.7 ± 0.2 mm, range 0.8–4.1, n = 44) *S. dekayi*. Slug remains were predominant in all sampled months except September, which had a single sample with earthworm setae (Figure 10). All 84 samples contained undigested plant material and soil grains. Plant material included fragments of leaves, flowers, and stems, as well as seeds (Figure 11). Soil grains were more prevalent in fecal samples that also contained earthworm setae. Six samples contained fragments of millipedes (Figure 12). Sixteen fecal samples contained one (n = 10), two (n = 5), and four (n = 1) mites (Figure 13) of the order Parasitiformes (suborder Mesostigmata) and order Acariformes (suborder Prostigmata). One of the mites observed was alive in a fresh fecal sample (Figure 14). Immature nematodes were observed in four samples, two alcohol preserved and two fresh. An insect (Homoptera) was found in a single sample (Figure 15). Whole and fragments of snail shells (to 2.1 mm in width) were present in four samples. A single sample included 8 gastropod eggs (Figure 16). The outer layer of the eggs was 2.0 mm by 1.9 mm, a gelatinous substance was found between the outer layer and the 1.3 mm blastula. A glass sphere was found in one fecal sample; a 3.2 mm piece of glass was found in another. Four fecal samples contained from one to numerous immature nematodes (Figure 17).

Discussion

Few studies have quantified the relative importance of slugs and earthworms in the diet of *S. dekayi*, and those that have, consist of relatively small sample sizes. Judd (1954) found slug remains in six, earthworm setae in two, and remains of both slugs and earthworms in one *S. dekayi*. Surface (1906) reported that slugs and snails represented 67% and earthworms 17% of the food items found in four *S. dekayi*. Surface did not mention whether any of the specimens contained both slugs and earthworms. Of 18 *S. dekayi* examined by Hamilton and Pollack (1956), 14 had eaten earthworms and four had consumed slugs. Of six scats examined by Pisani (2009), five contained earthworm setae. Fitch (1999) noted that two *S. dekayi* had eaten *D. laeve*. Both Pisani's and Fitch's observations were from snakes in Kansas. The proportion of slugs in the diet of the present study was higher, but similar to those of Judd's and Surface's. Of 13 *S. dekayi* from my site that regurgitated prey, ten disgorged slugs (*Arion* sp. and *Deroceras* sp. and *D. reticulatum*), three disgorged earthworms (Gray, 2013; Gray, unpublished data). The reason for the greater proportion of slugs in the diet may be due to several factors. Earthworms may be less abundant than slugs. Slugs appeared to be encountered more frequently than earthworms at my site. Earthworms may be more difficult to capture and ingest whole. Earthworms may autotomize their tail end if it is grasped, and subsequently escape. Finally, slug remains (e.g., jaws and shells) are more easily detected than are earthworm setae, which typically require higher magnification to observe (30×).

Two limacid slugs occur at the study site, *D. laeve* and *D. reticulatum*, with the latter being much more abundant. The shells, especially those larger than 3 mm, and oxygnathous jaws were likely from *D. reticulatum*. Some of the smaller shells (≤ 3 mm) could have been from *D. laeve* or immature *D. reticulatum*. Three arionid slugs, *A. hortensis*, *A. intermedius* and *A. subfuscus*, are found at the site. When offered *A. subfuscus*, captive *S. dekayi* refused to consume them (Gray, pers. obs.). The odontognathous jaws were likely from *A. hortensis*, as *S. dekayi* does consume this species at the site.

The estimated maximum BL (27 mm) of slugs in the present study was the same as that for eight slugs (mean BL 15.5 ± 6.4 mm, range 7.0–27 mm, n = 8) disgorged by *S. dekayi*. In addition to producing mucus as a defense, slugs may contract, thus increasing their girth, to try to prevent being consumed. It is possible that slugs larger than 27 mm BL have too much girth to be consumed by *S. dekayi*. Feeding trials utilizing slugs of various BLs could be conducted to test this hypothesis. Estimated maximum mass (0.42 g) was slightly higher than the maximum mass of 0.25 g observed in regurgitated slugs. Water content of slugs can vary considerably due to loss by evaporation, mucus production, and defecation, or gains such as feeding and absorption (Runham and Hunter, 1970; South, 1992). Increased mucus production during locomotion in a saturated environment caused *D. reticulatum* to lose 17% of its original body weight in 40 minutes (Dainton, 1954). The use of alcohol to preserve the slugs used in the regression analysis may also have significantly altered the water content, thus confounding the estimation of mass.

Male SVL was a poor predictor of prey size (SL) ($r^2 = 0.01$, $P = 0.59$); female SVL was a better predictor of SL ($r^2 = 0.50$, $P < 0.01$). These differences are likely the result of male *S. dekayi* having relatively larger heads and gapes than females, allowing them to consume a wider range of prey sizes.

The difference in prey size, as implied from SL, between juvenile and adult *S. dekayi* is expected. Within species, larger snakes have a larger gape and consume larger prey than smaller conspecifics (Arnold, 1993). In *S. dekayi*, females are on average larger than males (King, 1997; Gray, in press). Based on body size, one would expect females to consume relatively larger prey than males. This, however, is not the case. King

Figure 13. A mite (50× magnification) found in a *Storeria dekayi* fecal sample.

Figure 14. A mite (50× magnification) found alive in a fresh *Storeria dekayi* fecal sample. The mite was likely in or near the snake's cloaca when the sample was collected.

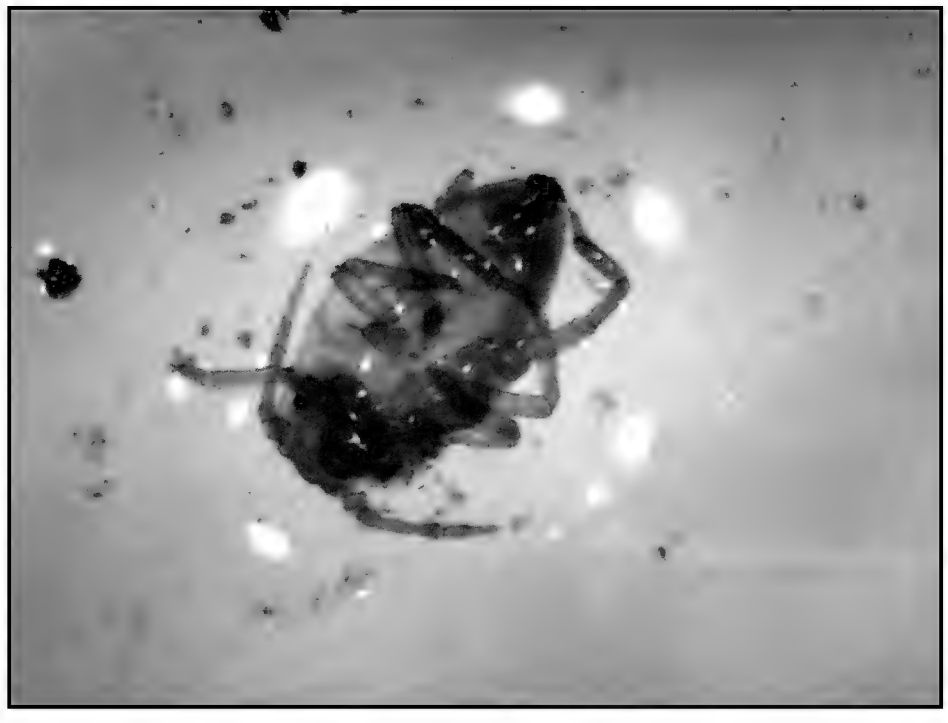

Figure 15. An immature insect (Homoptera) (20× magnification) found in a *Storeria dekayi* fecal sample.

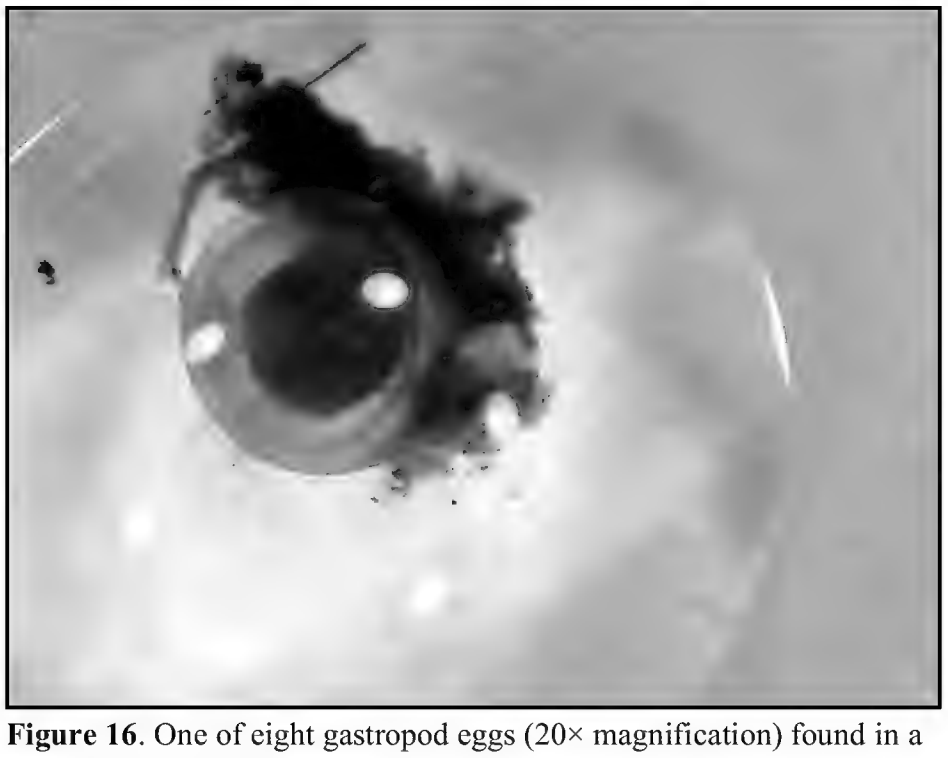

Figure 16. One of eight gastropod eggs (20× magnification) found in a *Storeria dekayi* fecal sample.

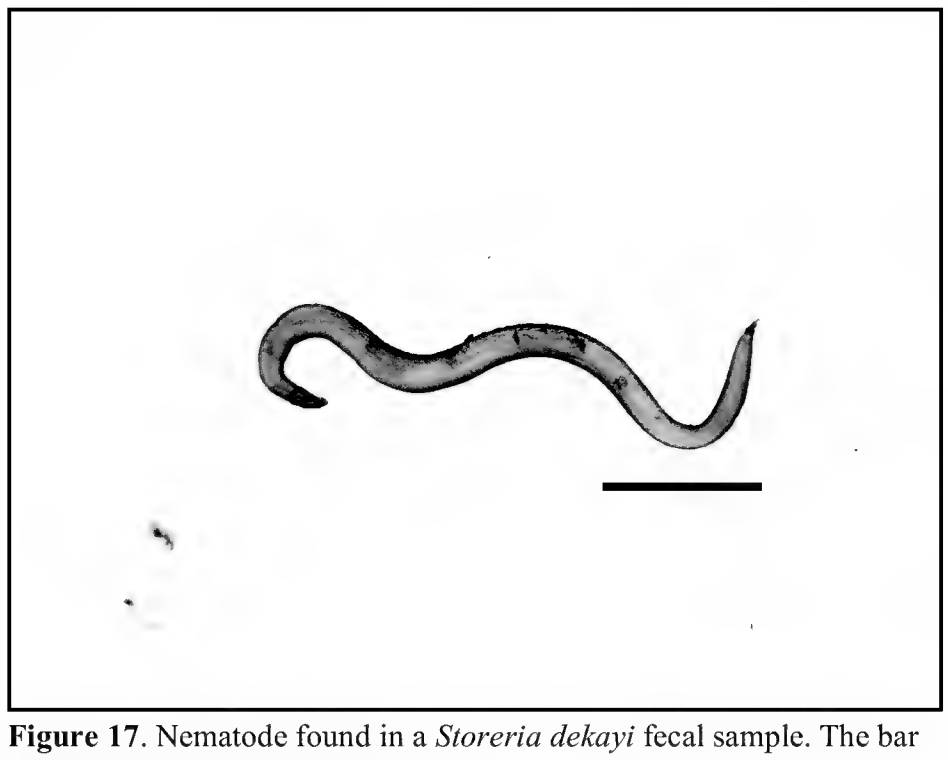

Figure 17. Nematode found in a *Storeria dekayi* fecal sample. The bar in the image represents 1 mm.

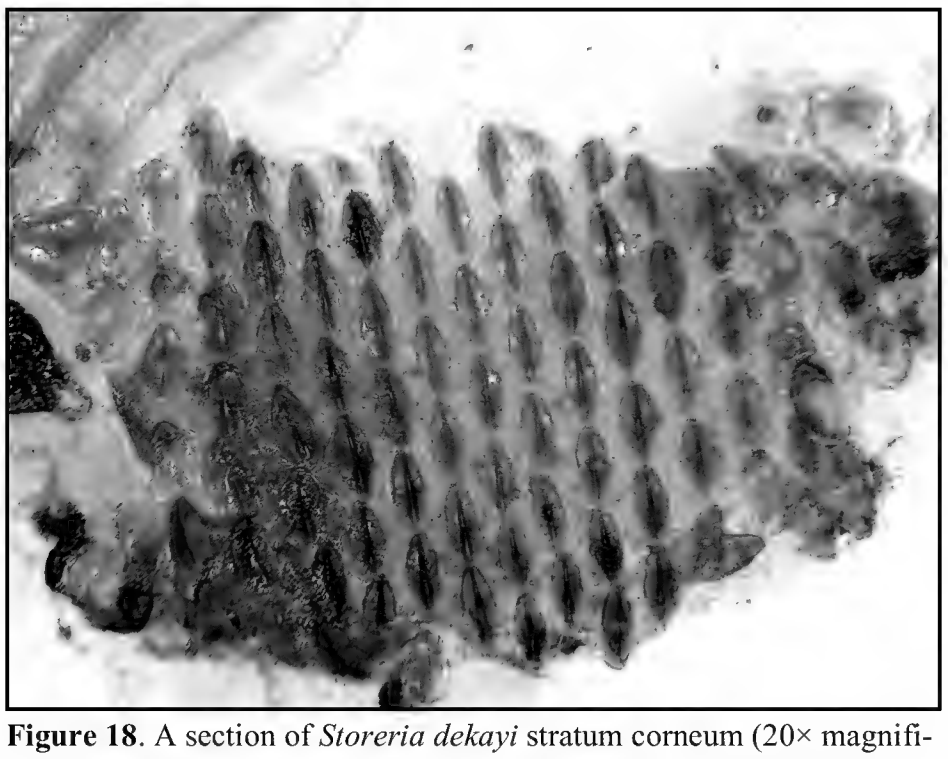

Figure 18. A section of *Storeria dekayi* stratum corneum (20× magnification) found in a fecal sample from a Milksnake, *Lampropeltis triangulum*. The undigested stratum corneum could be mistaken for a shed snake skin.

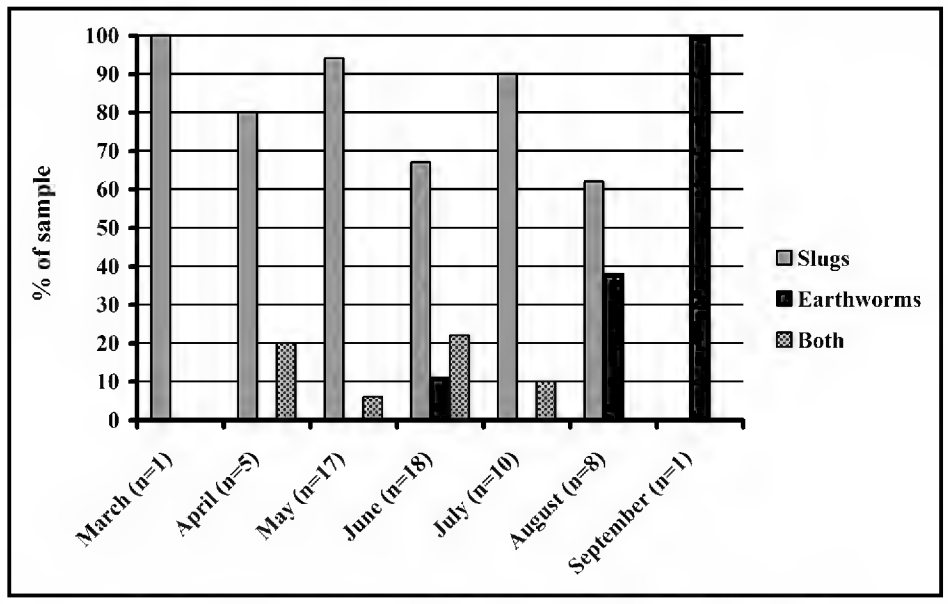

Figure 10. Relative percentage of prey remains in fecal samples obtained from *Storeria dekayi* during March–September. The number in parentheses following each month represents the total number of samples for that month. For example, in July there were 10 samples, nine (90%) containing slug remains and one (10%) with both slug and earthworm remains.

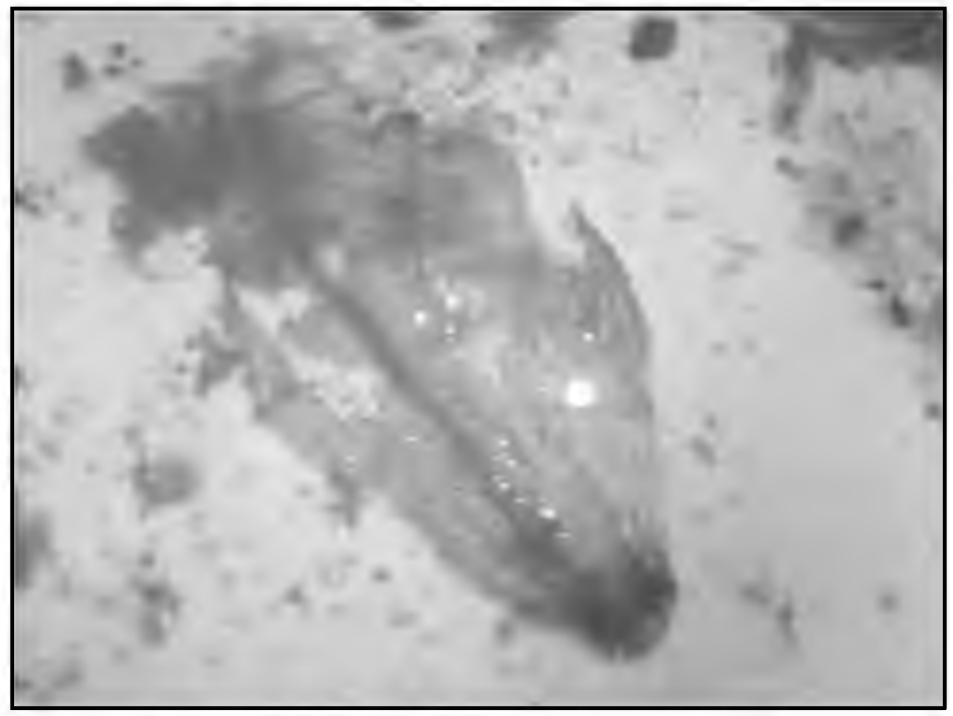

Figure 11. Leaf fragments (20× magnification) found in a *Storeria dekayi* fecal sample.

(1997) demonstrated that male *S. dekayi* have relatively larger heads than females. Sexual dimorphism in head size may reduce differences in maximum prey size, resulting in a greater overlap in prey size between male and female *S. dekayi* than might be expected on the basis of body size alone (King, 1997, 2002). The relatively larger head of male *S. dekayi* may help explain the results of the current study, with no significant difference in prey size (inferred from SL) between sexes despite a significant difference in body size. The lack of a significant correlation between male SVL and SL implies that male *S. dekayi* may consume a wider range of prey sizes compared to females of equal SVL. The significant correlation between female SVL and SL implies that as female *S. dekayi* increase in SVL, the average size of prey consumed increases.

Because each slug has only one shell, jaw, and radula, it is possible to determine the minimum number of prey consumed by *S. dekayi* by the remains occurring with the highest frequency. For example, an adult female (247 mm SVL) *S. dekayi* contained seven shells, three jaws, and two radulae. Thus, it can be assumed that this specimen consumed at least 7 slugs within the past day or two. Unfortunately, it is not possible to estimate the number of earthworms consumed from setae found in fecal samples. If earthworm setae are present, it can only be stated that at least one earthworm was consumed.

The size of the mites (0.2–0.7 mm) makes it highly unlikely that they were prey of the snakes. The live mite found in a fresh fecal sample must have been in or near the cloaca when the sample was collected. It was not possible to determine whether the mite I observed was parasitic on the snake or not. Ernst (2003) found mites under the scales of 41 of 702 *S. dekayi* examined from his two southeastern Pennsylvania sites. He considered the rates of mite infestation in Pennsylvania populations to be low. Mites in the genus *Riccardoella* are reported to live in the mantle cavity of slugs, including *D. laeve* and *D. reticulatum* (McDaniel, 1979; Godan, 1983). However, none of the mites found in fecal samples resembled *Riccardoella* (McDaniel, 1979). Furthermore, none of the *D. reticulatum* (n = 25) dissected for use in the regression analysis contained mites in the mantle cavity. Gray (2013) documented a millipede that was disgorged along with slugs by a *S. dekayi*. Millipedes, mites, insects, snail shells, and glass found in fecal samples were most likely ingested incidentally by the snakes while consuming slugs or earthworms. It is also possible that such items were initially consumed by slugs and earthworms, which were in turn consumed by the snakes.

Previous reports of soft-bodied insect larvae, beetles, and isopods as food items of *S. dekayi* (Atkinson, 1901; Judd, 1954; Wright and Wright, 1957; Langlois, 1964) are more than likely the result of accidental ingestion by snakes while consuming slugs or earthworms. Sow bugs were abundant under cover at my site, yet no isopod remains were observed in any of the 84 fecal samples. McCauley (1945) reported on two *S. dekayi* from Maryland. One contained a polygonaceous seed and a shed skin from a *S. dekayi*. McCauley's second specimen had small amphibian eggs and considerable vegetable remains. On two occasions, Ernst (2003) observed captive female *S. dekayi* consume neonates. The shed skin observed by McCauley may have been the stratum corneum of a consumed conspecific. The keratinized stratum corneum does not digest, and may be mistaken for a shed skin (Figure 18). McCauley did not specify the actual size of the supposed amphibian eggs he observed. The gastropod

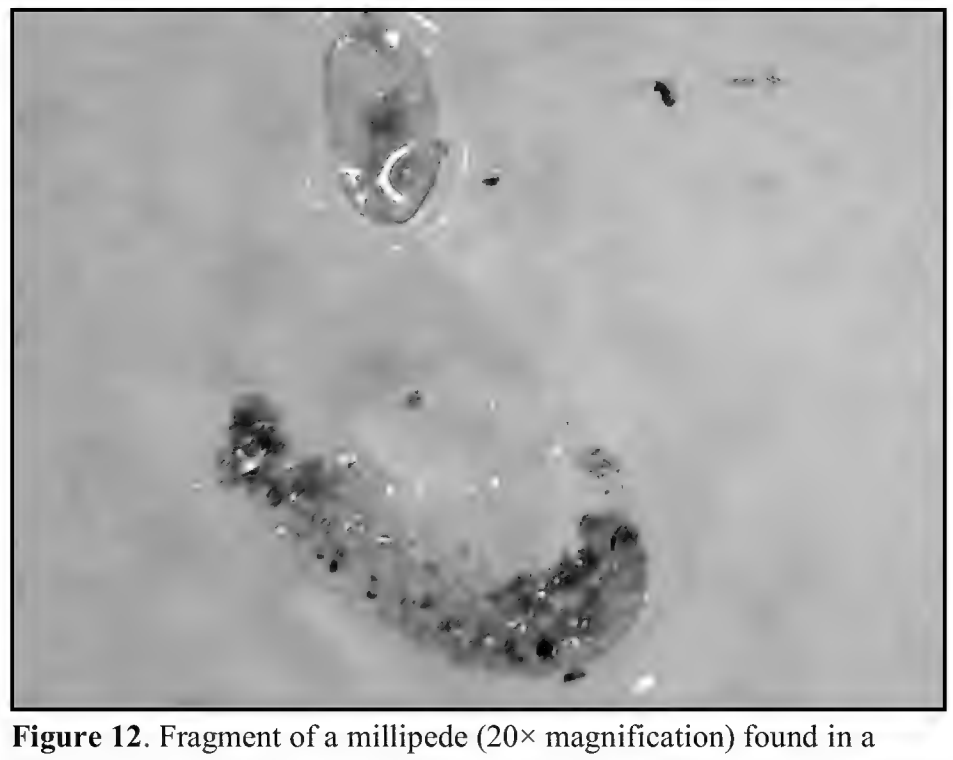

Figure 12. Fragment of a millipede (20× magnification) found in a *Storeria dekayi* fecal sample. In the upper portion of the image is a slug shell.

eggs I found in a *S. dekayi* fecal sample resembled amphibian eggs, but were much smaller (2.0 × 1.9 mm). I suspect a slug was consumed before it had laid its eggs. The slug was digested, but the eggs managed to pass through, although no longer developing. How they managed to survive the digestive tract of the snake is uncertain. Arionid eggs have a calcareous coating (South, 1992). Whether this coating would allow the eggs to pass through the snake's digestive tract intact is unknown. The eggs I observed were translucent and appeared not to have a calcareous coating. The considerable amount of vegetable remains McCauley observed would be consistent with fecal samples containing slug remains.

Although *S. dekayi* is reported to feed on snails (Rossman and Myer, 1990), it is unlikely that the shells and shell fragments observed in fecal samples were prey. The sizes of the shells (1.0–2.1mm) make it unlikely that they would have been sought out by the snakes.

Endoparasitism in *S. dekayi* seems to be low. In my study, only four of 84 fecal samples contained immature nematodes. Judd (1954) found nematodes (*Rhabdias fuscovenosa*?) in three of 10 *S. dekayi* from London, Ontario. Pisani (2009) examined six scats of *S. dekayi* from Kansas, and observed rhabditiform larvae in one of them. Ernst and Ernst (2006) list *Cosmocercoides dukae*, *Rhabdias fuscovenosa*, *R. vellardi* and *Rhabdias* sp. as parasitizing *S. dekayi*.

It is likely that a study specifically designed to sample for endoparasites would yield higher incidences. Such a study should utilize direct smears and fecal floatation methods, as well as taxon-specific mounting and staining procedures.

Slugs appear to be the predominant prey for *S. dekayi* in the northern portion of the species' range (Logier, 1958; Lazell, 1976; Minton, 2001; Johnson and Stark, 2013; Gray, in press), although King (2002) noted that earthworms are primarily consumed in the Lake Erie area. In southern populations earthworms (Kelly et al., 1936; Hamilton and Pollack, 1956) or slugs (Palmer and Braswell, 1995; Gaul, 2008) may be the primary prey. The predilection for slugs in the diet of northern populations may partially be explained by the post-Quaternary introduction theory of megadriles, which suggests that native earthworms were extirpated from glaciated regions during glaciation, and were later introduced by agents/vectors such as man (Reynolds, 1994; Reynolds and Wetzel, 2004). Slugs, of course would also have been extirpated from the region. However, compared to earthworms, which are poor dispersers (Reynolds and Wetzel, op. cit.), gastropods are better dispersers. Presently, very few earthworms considered native to North America occur north of the Wisconsinan glacial boundary; conversely, native slugs (e.g., *D. laeve*, *Megapallifera mutabilis*, *Pallifera* spp., and *Philomycus* spp.) occur well into glaciated regions of the United States and southern Canada (Hubricht, 1985; Grimm et al., 2009). South of the glacial boundary both native earthworms and slugs would have been present. Therefore, populations of *S. dekayi* in the north likely evolved to consume slugs; while for those in the south, the preference of prey was dependent upon which prey were more available at a given locale. A similar trend in prey preference is seen with ring-necked snakes, *Diadophis punctatus*. In northern populations where native earthworms are absent, plethodontid salamanders are the primary prey; while in the south, earthworms are predominant (Gray, 2010). In North Carolina however, earthworms are predominant in the diet of *D. punctatus* in the Coastal Plain, whereas plethodontid salamanders are primary prey in the Mountains (Palmer and Braswell, 1995). The introduction of nonnative earthworms and slugs into North America has provided *S. dekayi*, and other slug- and earthworm-eating snakes, an abundant and widely distributed food source (Gray, 2005; Gray and Lethaby, 2008). In Erie County, Pennsylvania, nonnative slugs and earthworms are abundant at sites with *S. dekayi* and/ or *S. occipitomaculata* (Gray, 2010; Gray et al., 2013).

Exotic species may act as a selective force on native species with which they interact. In Australia, the introduced cane toad, *Rhinella marina*, is toxic and fatal to most snakes that would consume them. However, two Australian snakes, *Pseudechis porphyriacus* and *Dendrelaphis punctulatus*, have adapted to the toads by evolving relatively smaller heads (Phillips and Shine, 2004). A relatively smaller head and gape decreases the snake's ability to ingest a toad large enough to make a fatal meal (Shine and Bonnet, 2009). Native species may also make evolutionary adjustments to an invading exotic which enables them to utilize the exotic to their benefit (Cox, 1999). The butterfly *Euphydryas editha* has rapidly evolved to prefer an exotic plantain, *Plantago lanceolata*, over its native host plant, Chinese houses, *Collinsia parviflora* (Singer et al., 1993). King et al. (2006) noted more rapid growth and attainment of larger body size in Lake Erie watersnakes, *Nerodia sipedon insularum*, that have shifted their diet to predominantly round gobies, *Neogobius melanostomus*. Whether or not *S. dekayi* prefers exotic slugs or earthworms to native ones has not been determined. However, nonnative slugs *Arion* spp., *A. hortensis* and *D. reticulatum*, and the exotic earthworm *Lumbricus rubellus* are the predominant prey of *S. dekayi* at my site. It seems very likely that the ubiquitous nonnative slugs and earthworms have made it possible for *S. dekayi* and other species, such as *Thamnophis brachystoma*, to thrive in urban areas (Gray, 2005; Gaul, 2008).

Acknowledgments

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Notes on the Distribution of *Scaphiopus holbrookii* in Maryland

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Due to their fossorial habits and the heavy rainfall required to stimulate breeding, spadefoot toads, *Scaphiopus holbrookii*, are not one of Maryland's frequently encountered anurans. With the exception of an isolated piedmont population in Frederick County (current status unknown), the species is confined to the Coastal Plain Physiographic Province (Harris, 1975). Although the literature concerning this species in Maryland (construed herein to include the District of Columbia) is largely confined to locality records, many questionable and erroneous statements have been published. It is the purpose of this note to correct these errors and present an updated distributional map. Museum abbreviations refer to the following collections: CM (Carnegie Museum of Natural History), MSB (Museum of Southwestern Biology, University of New Mexico), MVZ (Museum of Vertebrate Zoology, University of California, Berkeley), NHSM (Natural History Society of Maryland), NHSM/HSH (Natural History Society of Maryland/Herbert S. Harris, Jr.), SMNS (Stuttgart State Museum of Natural History), TSU (Towson University), UF (Florida Museum of Natural History, University of Florida), UIMNH (University of Illinois Museum of Natural History), UMMZ (Museum of Zoology, University of Michigan), USNM (National Museum of Natural History).

In keeping with the elusive nature of the species, precisely when *Scaphiopus holbrookii* was first collected in the area is unknown. The earliest record is USNM 3976, a lot of three specimens from the District of Columbia. No date is associated with this material; however, one specimen was donated to the University of Michigan (UMMZ 3901) "ca. 1861" (S. W. Gotte, personal communication). None of these specimens are extant (S. W. Gotte, personal communication; G. E. Schneider, personal communication). The oldest existing specimen from the District of Columbia is SMNS 1730 collected in 1875; no additional locality data accompany this specimen. The first published report of the spadefoot toad in the area is that of Hay (1902), who stated: "There is a single record for this rare species within our limits." However, since Hay listed localities for the District of Columbia, Maryland and Virginia, it is unknown to which jurisdiction he was referring. Reed (1956a, 1957c), who did not scrutinize Hay's article, assumed this to mean that he was referring to the District of Columbia. Another early record, again from the District of Columbia, is USNM 35613, a larval lot collected on 14 May 1904 and preserved on 23 May (1904). These were discarded in 1970 (S. W. Gotte, personal communication). The latest record for the District of Columbia was provided by Mansueti (1947) who reported that R. Kellogg (Division of Mammals, USNM) "has recorded these toads in fair numbers in the vicinity of Woodridge, District of Columbia." Unfortunately Mansueti did not provide a date, nor, once again, is there any extant material.

The first documented record for a spadefoot toad in Maryland is USNM 104406 from Denton, Caroline County, collected in April 1938 by R. H. McCauley, Jr. McCauley collected this specimen incidental to his field work on the reptiles of Maryland and the District of Columbia (McCauley, 1945), and either did not recognize its significance or simply elected not to report it. Mansueti (1941) stated that *Scaphiopus holbrookii* "has not been collected or heard of in Maryland," yet effusively credits McCauley for having reviewed his manuscript. The first published reports of *S. holbrookii* from Maryland came from Conant (1945), who merely listed it from Caroline and Wicomico Counties. The basis for the former county is almost certainly the aforementioned McCauley specimen, while the latter county is vouchered by specimens from Willards (MSB 29399-29400) collected on 14 June 1941. Like McCauley, Conant also seemed unaware of their significance. Following Conant's checklist, Mansueti (1947) provided a number of new records and published the first distributional map of the species. In an odd coincidence, Reed (1956a) and Stine et al. (1956) appeared back-to-back in the same journal, reporting more new localities. [Oddly Wasserman (1968) cited Reed (1956a) but not Stine et al. (1956)]. In a comment that was overlooked or ignored by Harris (1969, 1975), Reed (1956a) remarked: "In Frederick County which is in the Piedmont and Blue Ridge regions there are several coastal recesses near Thurmont and Emmitsburg where it [*Scaphiopus holbrookii*] has been reported and collected." To my knowledge there is no support for this statement, and in a subsequent publication Reed (1957c) made no mention of these localities, although he somehow misconstrued one of the two piedmont localities (UIMNH 2979) as representing two separate sites. Cooper (1956) summarized records for Anne Arundel County. The era of reporting multiple new sites ended with Hardy and Mansueti (1962), who listed five localities for Calvert County. Unfortunately there are no extant *S. holbrookii* in the Reed collection (this included the collection of R. F. Daffin which all came to the NHSM in 1994), none in the Fowler collection from the sites reported in Stine et al., and the Stine collection was apparently discarded (Miller, 2011). The private collection of R. S. Simmons included 32 specimens from six localities in three counties. With the exception of one specimen at UF, this material is now at the NHSM; however, all NHSM specimens are completely desiccated. Hardy and Mansueti likely preserved specimens from at least some of the localities they reported and deposited them in the Chesapeake Biological Laboratory (CBL). Hardy was unresponsive to queries about the fate of this collection and whether a catalogue ever existed, and the current director at CBL and her staff have no knowledge of it (M. A. Palmer, personal communication).

In a publication that did much to distort the distribution of the frogs of Maryland and nothing to clarify it, Hildebrand (2005) provided a new report for the spadefoot toad in Frederick County. This was based on at least one personal observation by Hildebrand, and on one or more—it is not clear—unsubstantiated reports of the species calling between 1999 and 2004 through

the North American Amphibian Monitoring Program (NAAMP), which Hildebrand coordinated in Maryland. According to Hildebrand, the NAAMP was composed of volunteers, who, after training, monitored vocalizing frogs from roadside stations throughout the state. Hildebrand did not state what these routes were or specify the dates and times. It is beyond the scope of this note to correct the numerous errors in Hildebrand's study. What is germane here is Hildebrand's failure to provide specifics on the Frederick County report (or reports) and his contradictory comments on the conservation status of this species. *Scaphiopus* in Frederick County is isolated from the rest of its range in Maryland (Cooper, 1965; Harris, 1975), and was first and last reported from this county by Stine et al. (1956), based on UIMNH 2979 (not "2797"), collected on 13 September 1948, and a specimen formerly in the private collection of R. S. Simmons (now UF 10620), taken on 21 April 1956. These two sites are 4.0 km apart. Since the spadefoot toad had not been reported from Frederick County in 49 years it would have been of great interest to know precisely where and when the species was heard in this county. On page 121 Hildebrand called populations of 13 species, including *Scaphiopus*, "stable," but then on page 125 he ranked it as one of the "least common frogs" detected in his study. Then, on page 127, he asserted that *S. holbrookii* is " 'In need of conservation' . . . especially west of the Chesapeake Bay." However, on page 175 he stated "*Scaphiopus holbrookii* [sic] fossorial nature and unpredictable reproductive events makes it difficult to accurately determine the status in Maryland." Beyond these confused statements, one wonders how his volunteers could have been mustered to meet the unusual conditions required to elicit calling by this species. And, of course, there remains the overarching concern of why anything they proffer should be trusted.

Hildebrand also stated: "The [sic] Eastern Spadefoot Toads are considered common over their entire range (Young et al. 2004) including Maryland." This sentence was repeated in a later publication (Hildebrand, 2009). First, Young et al. assigned the rank of Least Concern to this species, meaning "Species that do not qualify for Critically Endangered, Endangered, Vulnerable or Near Threatened. Widespread and abundant taxa are included in this category." This is quite different from saying that *S. holbrookii* is "considered common over their *entire* [emphasis added] range . . . ." Furthermore, Hildebrand's assertion evinces an extraordinary lack of rudimentary research concerning the status of *Scaphiopus holbrookii* outside Maryland. Many authors, writing about areas within their expertise, differ with Hildebrand's reading of Young et al. Johnson (1977) stated: "The eastern spadefoot toad has a restricted range in Missouri and, due to its low population size in this state, should be protected by the Missouri Department of Conservation." Johnson (1998), again commenting on Missouri and in a reference that Hildebrand (2005) cited, noted that *S. holbrookii* is "on the state's rare and endangered species checklist ...." (This decision, fortunately, was not based on the title of his article.) McCoy (1982): "Colonies of *Scaphiopus* in Pennsylvania are scattered and extremely localized." Although McCoy had only four vouchered localities and two literature records, the species was not even mentioned in Genoways and Brenner (1985). Hulse et al. (2001), in another reference that Hildebrand both cited (2005) and listed (2009), stated: "It is one of the least common anuran species in Pennsylvania; however, it may be more commonly distributed within Pennsylvania than is apparent." [Urban and Gipe (2010) would later write: "The eastern spadefoot was selected as a Pennsylvania Species of Greatest Conservation Need because of its rarity within the commonwealth . . . . It is listed as an Endangered Species by the Pennsylvania Fish and Boat Commission . . . . "] Klemens (1993), following extensive field work and research, declared that this species is "one of southern New England's rarest amphibians." Davis and Menze (2000) stated: "The Eastern Spadefoot is the only frog on the Ohio Endangered Species List." Minton (2001) on the spadefoot in Indiana: "It is listed as a Species of Special Concern in Indiana." Trauth et al. (2004) concerning Arkansas: "The Arkansas Natural Heritage Commission has ranked both subspecies of the eastern spadefoot as rare and susceptible to extirpation." Gibbs et al. (2007) stated: "The eastern spadefoot is listed as a species of Special Concern in New York State." Currently, NatureServe (2013) lists *S. holbrookii* as Critically Imperiled in five states, Imperiled in five others and Vulnerable in one.

Two other noteworthy lapses in Hildebrand's account were his failure to map the only site known from Harford County (Miller, 1977) and his odd treatment of an NAAMP report from Howard County. The species is not currently documented from this county, although it is well known from adjacent Anne Arundel County (Harris, 1975; Miller, herein). He called this unspecified locality "questionable because it was associated with atypical habitat." It did not occur to Hildebrand to question the validity of the identification. Even if the identification was correct—and this is a big assumption—one wonders why the site would be discounted simply because it did not conform to someone's (Hildebrand's?) notion of "correct" reproductive habitat. Although *Scaphiopus holbrookii* may well occur in Howard County, I suspect this "record" to be based on misidentified *Bufo fowleri*. However, we are not likely to ever know because, once again, we see the failure of Hildebrand and the NAAMP, in addition to numerous other casual herpers in Maryland and elsewhere, to document their discoveries in a verifiable manner.

In what appeared to be an attempt to summarize the distribution of this species in Maryland, Harris and Crocetti (2008) committed numerous errors ranging from minor to major. Cooper (1965) is cited in the first sentence but not in the Literature Cited; similarly Cooper (1956) is cited in the references but not in the text. Cooper (1960) is given the 1965 title, but inaccurately. A major reference (Hardy and Mansueti, 1962) and numerous lesser ones (Conant, 1945; Reed, 1956b, 1957a, b, c, 1958; Kramer, 1966; Czarnowsky, 1975; Smithberger and Swarth, 1993; Touré and Middendorf, 2002) were overlooked altogether. Three of these publications appeared in Harris' own privately controlled journal. Harris and Crocetti claimed to report the northernmost populations in Anne Arundel County. They cited three new localities for this county, but never specifically stated that they are the northernmost, which they are not, even allowing for their "clarification" discussed below. NHSM/HSH 89-92 from Bayside Beach taken in July 1967 and presumably collected by Harris are at a slightly higher latitude than the populations they report from Grover Road, Old Oak Road and

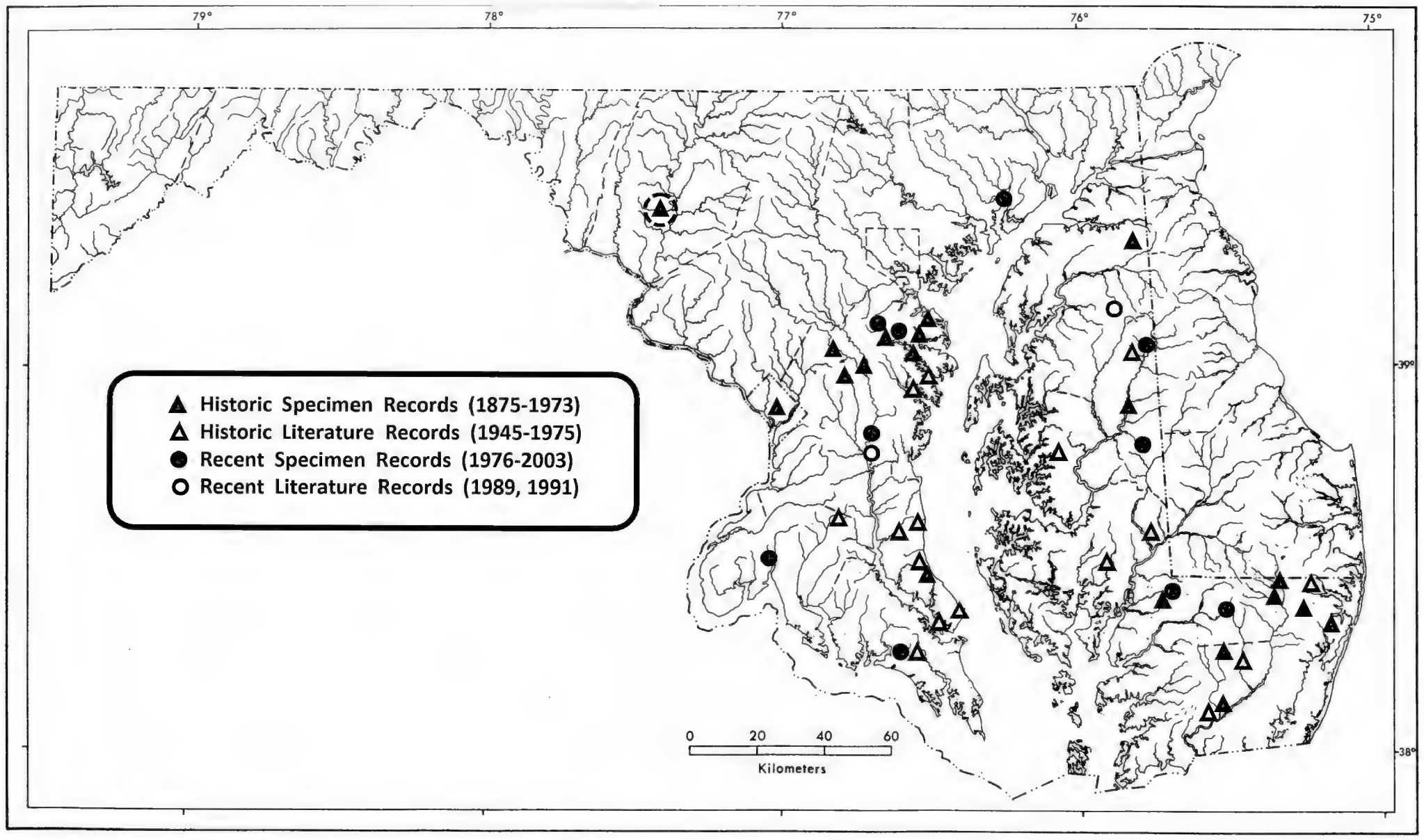

Figure 1. Map of Maryland, Delaware and the District of Columbia showing locality records for the spadefoot toad, *Scaphiopus holbrookii*, in Maryland and the District of Columbia. Dashed circle encompasses two piedmont sites.

Stevenson Lane. Also, Harris and Crocetti stated that their "Glen Burnie = Millersville" site (see below) was the previous northernmost locality. This is also erroneous. TSU 1789 from Elvaton, collected on 24 April 1977 is somewhat farther north, and numerous specimens taken between 1958 and 1969 at or near Lake Shore are on the same latitude as the "Glen Burnie = Millersville" site. I presume Harris is the collector of at least some if not all of the eight specimens taken on four dates from this area. Oddly Harris and Crocetti have no comment on the remarkable rediscovery of *Scaphiopus* in Frederick County by Hildebrand (2005), nor do they cite this reference.

More carelessness dominates their third paragraph. In an attempt to clarify a locality published by Stine et al. (1956), the authors wrote: "The record reported as Glen Burnie [Anne Arundel County] in that paper (what the area was called at that time) is now actually south of Glen Burnie in Millersville." First, Glen Burnie has never been an incorporated town, so its limits are undefined. Of course, if Stine et al. had fixed the center of Glen Burnie, stated a distance from this point, and coupled it with road data there would be no need for a clarification. Apparently relying on a bad internet map (e.g., www.ask.com/maps), Harris and Crocetti arrived at their conclusion as to where Millersville is now centered. Millersville, also unincorporated but easily fixed at the intersection of Millersville Road and Cecil Avenue, is actually located 6.0 km SSW of the fictitious one, as any credible source will show (Maryland State Planning Commission . . . , 1941; USGS Odenton quadrangle; the Anne Arundel County topographic map derived from the quadrangles; State Highway Administration map). The authors also stated: "It [the *Scaphiopus* site] is less than 0.5 mi N East-West Highway on Veterans Highway." The correct name of the former road is East-West Boulevard. This is not an altogether trivial point since there is an East-West Highway (much of MD Route 410 is so designated) in Montgomery and Prince George's Counties, and the latter county borders Anne Arundel County.

The most startling aspect of the Harris-Crocetti note is their report of the first record of *S. holbrookii* from Baltimore County. From at least the time the species was reported from the coastal plain of Harford County (Miller, 1977) it seemed likely that this species would eventually be found on the coastal plain of Baltimore County. Although Harris and Crocetti state that their new site is on the coastal plain, it is in fact from a somewhat rugged and extensively wooded area that is unquestionably in the piedmont. The authors also state that the locality is "on [US] Route 1 just prior to the Gunpowder River." The so-called Gunpowder River (actually a small estuary or tidal creek of short duration), formed by the confluence of the Gunpowder Falls and the Little Gunpowder Falls, occurs nowhere near US Route 1. However, based on other road data in their article, it is clear that the Little Gunpowder Falls is what they intended. I have conducted field work along the Little Gunpowder Falls throughout its length on numerous occasions and driven US Route 1 countless times. With one possible exception, there is no suitable reproductive habitat for *Scaphiopus* at the site reported by Harris and Crocetti. This exception occurs along the southeastern side of US Route 1, 0.3 mi (0.48 km) southwest of its intersection with the Little Gunpowder Falls. Here, carved from a steep, deciduously wooded slope, is a rather small flat area where a State Highway Administration salt storage dome and a radio transmission tower exist. These structures are nearly

surrounded by a ca. 2.5 m-high chain-link fence topped with barbed wire. After thunderstorms on 18 and 19 May 2011 (not sufficient to stimulate breeding by *Scaphiopus*, but adequate enough to gauge the site's suitability), I examined its interior on 20 May and was not impressed with its potential for providing a reproductive site for spadefoot toads. The woodland and topography surrounding the fenced area are decidedly unsuitable for the species, at least in Maryland. Although Harris and Crocetti described the breeding habitat of *Scaphiopus* at several sites in Anne Arundel County (one in great if awkward detail), they have nothing to say about the only important aspect of their note—the record from Baltimore County. All we are told is that Crocetti went from one active site in Anne Arundel County on 4 June 2008 (stated in Figure 1 but not in the text) and just happened to discover the Baltimore County site in "an area where he [Crocetti] is working ...." One is left to ponder what, if anything, this curious phrase means. Due to the foregoing concerns, I believe the authors need to provide a detailed explanation before this highly unusual locality can be accepted. As with nearly every article published in the *Bulletin of the Maryland Herpetological Society* from 1974 to the present, Received and Accepted dates appear. The absurdity of this practice for anything Harris publishes in his own privately controlled journal was pointed out long ago by McCranie and Wilson (1979), but some editors pay no attention to their critics—or propriety.

In a mystifying editor's note, Harris (2009) apologized for failing to include, in Harris and Crocetti (2008), White and White's (2002) Queen Anne's County "record." I queried J. F. White, Jr. concerning this and he was unable to provide any specifics. Accordingly the basis for the Whites' decision is unknown. Possibly the inclusion of Queen Anne's County on their map derived from Mansueti (1947), where he reported a possible but unspecified site for this county. In any event, the Whites' book (a second edition appeared in 2007 with an unchanged map) was a field guide produced for the public and contained virtually no original information. Indeed, it would have been unusual in such a work to find specific locality data. Furthermore, White and White should never be cited as a primary reference without first checking with the authors. A precise report for *S. holbrookii* in Queen Anne's County is 0.9 km NE Stevens Corner on the night of 20 May 1989. A chorus was heard by D. C. Forester and me after we finished recording *Hyla chrysoscelis* and *H. versicolor* nearby.

Figure 1 presents an updated map of the distribution of *Scaphiopus holbrookii* in Maryland. Specimen records take precedence over literature records. I have reluctantly accepted all of the literature records published by C. F. Reed that do not have ambiguous data. This includes not only those in his private collection and that of R. F. Daffin, but also those in the collection of D. W. Linzey (Wytheville Community College, Wytheville, Virginia; Linzey has been unresponsive to inquiries made over several years). As noted above, none of the Reed or Daffin material is extant, and most of what Reed published in herpetology has either been criticized (Conant, 1958; Cooper, 1959, 1969; Miller, 1993) or ignored (e.g., Cooper 1960). Reed also had difficulty identifying specimens, for example members of the *Rana pipiens* complex and mistaking *Rana clamitans* for *R. virgatipes*. Nonetheless it is difficult to see what he could have confused *S. holbrookii* with, hence their inclusion herein.

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Specimens Examined

Anne Arundel County: NHSM 3074; NHSM/HSH 7, 34, 37-40, 43-44, 89-92; TSU 104, 273-274, 1789, 8112-8113; USNM 578525-578527; Benfield (NHSM uncatalogued); near Priest Bridge (NHSM uncatalogued); Severna Park (NHSM uncatalogued). **Calvert County**: CM 140148-140157. **Caroline County**: TSU 8308-8309, 9843-9845, 9854; USNM 104406. **Charles County**: USNM 252545. **District of Columbia**: SMNS 1730. **Frederick County**: UF 10620; UIMNH 2979. **Harford County**: TSU 1539. **Kent County:** Massey (NHSM uncatalogued). **Prince George's County**: CM 28378; USNM 312646, 312647-312652, 533176. **St. Mary's County**: TSU 5905. **Wicomico County**: CM 29080, 30462, 34563, 35633; MSB 29399-29402; MVZ 244343; TSU 8399-8403. **Worcester County**: CM 58103 (9); MSB 29403-29404, 29405-29407, 29408-29409; USNM 560040. Additional Material Examined: **St. Mary's County**: NHSM 3073; NHSM/HSH 8-9.

Literature Records Accepted

Anne Arundel County: (near) Annapolis (Reed,1956a; 1957a,c; Stine et al., 1956); Briarcliff (Stine et al., 1956; Cooper, 1956); (near) Benfield (Stine et al., 1956; Cooper, 1956); (near) Edgewater (Reed, 1956a, 1957a,c); "Glen Burnie" as "clarified" by Harris and Crocetti (2008) and reclarified herein; however, this site is subsumed by Benfield (NHSM uncatalogued); (near) Joyce Lane (Stine et al., 1956; Cooper, 1956); Jug Bay Wetlands Sanctuary (Smithberger and Swarth, 1993). **Calvert County**: Cove Pont (Mansueti, 1947; Reed, 1956a, 1957c); "Huntington" (Huntingtown) (Reed, 1957c); 1.8 mi S Sunderland (Reed, 1957c); Camp Roosevelt; near Hungerford Creek; Long Beach (subsumed by CM 140148-140157); Scientists Cliffs; Solomon's Island (Hardy and Mansueti, 1962). **Caroline County**: Goldsboro (Mansueti, 1947). **Charles County**: Cedarville Sate Forest (Stine et al., 1956). **District of Columbia**: vicinity Woodridge (Mansueti, 1947; considered subsumed by SMNS 1730). **Dorchester County:** "region of Sharptown and Eldorado" (Reed, 1956a,b; later listed as "Sharptown and Eldorado" in Reed, 1957c) "Steelneck [Steele Neck] Road, S [SW or WSW] Vienna" (Reed, 1957c). **Queen Anne's County:** 0.9 km NE Stevens Corner (see text). **Somerset County:** (just) N Pocomoke City (Reed, 1956a,b; 1957b,c); Tindly's Chapel (Stine et al., 1956). **St. Mary's County:** JCT Indian Bridge Road and St. Andrew's [Church] Road (Kramer, 1966). **Talbot County:** Easton

(Mansueti, 1947). **Worcester County**: Bishop (Stine et al., 1956); NE Pocomoke City, Pocomoke State Forest (Reed, 1956a,b; listed as NE Pocomoke City in Reed, 1957c); Mount Olive Church Road, 1.5 mi N JCT MD Route 12 (Czarnowsky, 1975).

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What You Missed at the November Meeting

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We elect the coming year's board members at the November meeting, and I think some people steer clear because they expect a lot of business that will only bore them. Admittedly our elections often lack drama, but we also always have the raffle and a speaker. For the election results please see elsewhere in the *Bulletin* because I want to talk about the speaker. Spoiler alert, I have the honor of once again representing your society as president. I'll have a difficult time filling that position as well as Jason Hood has, but I'll try.

Steve Barten,. Photograph by Ralph Shepstone.

We've had some great presidents for the CHS in the past, and our speaker on this cold November night once served in that position. Dr. Stephen L. Barten is a long-time member of your society and is just like our usual speakers. He's a terrific photographer (Google his name and many of the links are to photo credits) and an excellent orator, as well as a veterinarian. I've had the privilege of knowing him for many years, so I'm biased, but he's also a genial companion who displays wit, creativity and intelligence, making him excellent company.

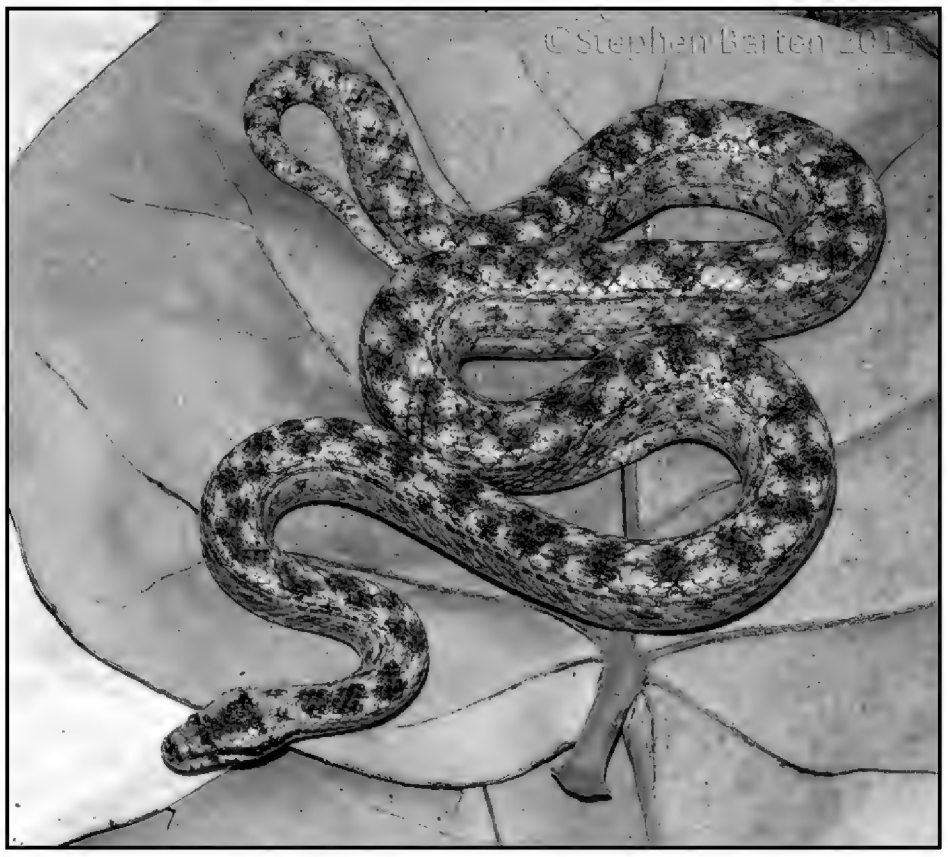
Steve mentioned that he'd only learned about his role about two weeks before the meeting. With his normal aplomb he created a presentation that was entertaining, educational, and beautiful. He began by telling us what he considered and rejected as suitable subjects. No veterinary topics because he decided that gross lesions and bloody wounds were not appropriate for Thanksgiving eve. Nothing from his Alaska photography trip because no herps were involved; the screen was filled with collages of brown bears and eagles. Nothing from his Hawaii trip because the only herp observed was a brown anole (*Anolis sagrei*) but we saw a photo of that common invasive along with wind surfers, honeycreepers, and spectacular Maui landscapes. We would have to be a different society to taste the fruits of those talks. As tempting as those talks would have been, Steve finally offered a compendium of his herping trips this year, and we did not miss the rejections. He titled his talk "Field Herping 2013" and he was going to take us along on four of his trips, beginning with Grand Cayman.

Dr. Barten is much in demand for veterinary speaking and teaching, so when offered an all-expenses-paid trip to the island of Grand Cayman to lecture at the St. Matthews University School of Veterinary Medicine he declared it a "no-brainer." Steve always does an excellent job of locating his talks, so we had maps showing the island's position south of Cuba in the Caribbean and a map of Grand Cayman showing the location of all the spots he'd be visiting on the island. His first photo was a blue iguana (*Cyclura lewisi*) with its bright blue skin and red eyes. He said that these animals, now somewhat recovered from the edge of extinction, could be found over much of the sparsely populated east end of the island. He showed photos of the island's breeding facility with the iguanas both inside and outside the pens, and we saw juveniles being raised for release and adults wandering the island. Each animal is tagged and known by the authorities. Pictures of the turquoise colored lizards in dramatic poses flashed before us. Then a bright green iguana (I*guana iguana*) with a fiery orange crest of spines showed us what a green iguana could aspire to in looks. Introduced to the island, they are now ubiquitous, but other photos proved that they could claim looks superior to any in captivity. Photos of the endemic Grand Cayman blue-throated anole (*Anolis conspersus conspersus*) with its bright greens, blues and yellow spots demonstrated that the island iguanas did not have a monopoly on good looks. Curly tailed lizards (*Leiocephalus carinatus varius*), while always interesting, showed that not all the lizards were colorful. We saw photos of Taco River sliders (*Trachemys decussata angusta*), stingrays, and Cuban treefrogs (*Osteopilus septentrionalis*), which are native to the island. Steve managed to get nice pictures of a captive Cayman Islands dwarf boa (*Tropidophis caymanensis*) with its yellow caudal lure. Perhaps my favorite picture was a green sea turtle (*Chelonia mydas*) floating in crystal clear water surrounded by rings of ripples than made it seem three-dimensional. Parrots and bananaquits and crocodiles (*Crocodylus acutus* × *rhombifer*) and Cayman racers (*Cubophis caymanus*) captured our attention. Then we moved to Texas.

Again we were put in our place with a map and Steve explained that a small group of CHS friends had been invited to

The Grand Cayman blue iguanas (*Cyclura lewisi*) definitely felt they ruled the island. Photograph by Steve Barten.

Not the most colorful of the Cayman Islands' lizards, but curly-tails such as this *Leiocephalus carinatus varius* are always engaging. Photograph by Steve Barten.



The Cayman Island dwarf boa (*Tropidophis caymanensis*). Photograph by Steve Barten.

A rugged canyon in the vicinity of the Devil's River in west Texas. Photograph by Steve Barten.

More lizards than snakes were found on this Texas trip. Spotted whiptail (*Aspidoscelis gularis*). Photograph by Steve Barten.

A really pretty turtle, the Rio Grande cooter (*Pseudemys gorzugi*). Photograph by Steve Barten.

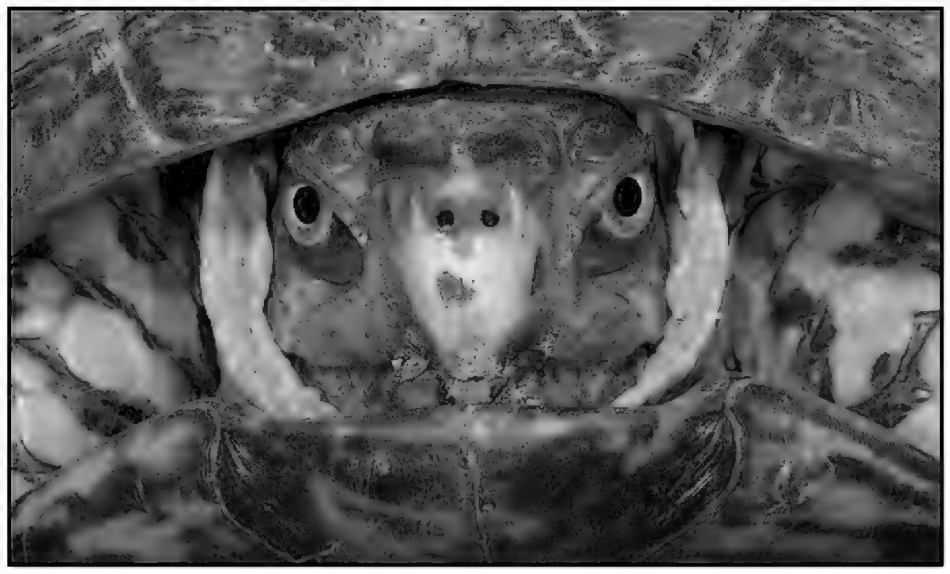
Eastern hognose (*Heterodon platirhinos*) digging a nest. Photograph by Steve Barten.

Copperheads (*Agkistrodon contortrix*) were found more often than usual on this southern Illinois trip. Photograph by Steve Barten.

explore some private land along the Devil's River in west Texas. Steve teased us with pictures of the potential prey such as gray-banded kingsnakes (*Lampropeltis alterna*) and Texas indigos (*Drymarchon melanurus erebennus*) and Baird's ratsnakes (*Pantherophis bairdi*) and rock rattlesnakes (*Crotalus lepidus*). We saw gorgeous shots of rugged west Texas landscapes and crystal clear waters before Steve admitted that on this trip the participants only found two snakes, but we saw nice pictures of a western ribbonsnake (*Thamnophis proximus diabolicus* × *rubrilineatus*) and an eastern black-necked gartersnake (*Thamnophis cyrtopsis ocellatus*). He ventured to the Devil's River in the company of several long-time friends who were all experienced herpers, but the terrain and the drought made it difficult for even those elites to find animals. With shots of people and terrain, canyon lizards (*Sceloporus merriami*) and vermillion flycatchers, tarantulas and bristly porcupines and centipedes, while maintaining a running commentary of surprises and adventures, Steve made it clear that the Texas trip wasn't at all a disappointment. The last Texas reptile we saw was a strikingly colorful Rio Grande cooter (*Pseudemys gorzugi*) swimming through the absolutely clear river water. The Texas trip didn't disappoint us either.

Then we went "Behind the Cheese Curtain" for a short look at eastern hognoses (*Heterodon platirhinos*). Moving stealthily, Steve captured pictures of two burrowing into the sandy soil for

Cottonmouths (*Agkistrodon piscivorus*) are always common on snake road. Photograph by Steve Barten.



This eastern box turtle (*Terrapene carolina*) would look even angrier if you could see his red eyes.. Photograph by Steve Barten.

nests. CHS member Carl Koch was the guide on this trip and had been exploring this habitat and photographing this behavior for several years. Bright photos of red-bellied snakes (*Storeria occipitomaculata*) showed how brilliant these little snakes can be and some amphibian larva were dip netted so we saw a gray treefrog (*Hyla versicolor*) tadpole with a colorful red tail.

Next Steve took us to southern Illinois and we saw pictures of the splendid terrain around Snake Road as well as the animals found. He gave us a brief overview of one of the most famous field herping sites in North America, mentioning that the road is closed to traffic in the spring and fall to protect the migrating snakes and stressed that no collecting is allowed. It is illegal to carry a snake stick, snake bag, or even a plastic bag, but photography is certainly accepted. A photo of a mudsnake (*Farancia abacura*) showed the incredible colors of that snake, even though the specimen was dead when found. Watersnakes (*Nerodia* spp.) and cottonmouths (*Agkistrodon piscivorus*) adorned the screen and multiple pictures of copperheads (*Agkistrodon contortrix*) displayed the beauty of those snakes and the professionalism of Steve's photography. A rough greensnake (*Opheodrys aestivus*) curled through brush that matched the snake's color and an opaque juvenile ratsnake (*Pantherophis spiloides*) hung rather uncharacteristically in a small shrub, as did a juvenile racer (*Coluber constrictor*). A Ouachita map turtle (*Graptemys ouachitensis*) basked between two red-eared sliders (*Trachemys scripta elegans*) and we saw shots of elegant eastern box turtles (*Terrapene carolina*), one happily munching on a mushroom. Steve included a close up of a huge orb weaver spider (a banded argiope if my internet searching turned up the correct identification) wrapping its prey and asked me to mention that he dedicated this slide to CHS board member Linda Malawy. Even if you don't know Linda I suspect you can guess why; it's not because she likes spiders. He closed with pictures of a group of aptly named state-endangered Rafinesque's big-eared bats (*Corynorhinus rafinesquii*) hanging from a roof staring at the camera.

Parts of Steve's field herping talk were a wonderful revisit for some of us, and for those who take pictures as poorly as I do, fostered a wish for better photographic skills. And his coverage of the places we hadn't been stirred a desire to go. We might never satisfy those desires, but with speakers like Steve bringing radiant photos, engaging dialogue and educational nuggets to our meetings we come close. As I said, just like our usual speakers.

Unofficial Minutes of the CHS Board Meeting, November 15, 2013

The meeting was called to order at 7:44 P.M. at the Schaumburg Public Library. Board members Josh Baity, Stephanie Cappiello, and Cindy Steinle were absent.

Officers' Reports

Recording Secretary: The minutes of the October 18 board meeting were read, discussed and accepted.

Treasurer: The October treasurer's report was given, discussed and accepted.

Membership Secretary: Numbers are holding at just under 500. The list of expiring memberships was read. Mike moved to extend former CHS president Lori King's membership for another year, Linda seconded, and the motion passed unanimously.

Corresponding Secretary: Stephanie was absent. She is still working on resolving the phone issues.

Sergeant-at-arms: October meeting attendance was 38.

Committee Reports

Shows:
- Notebaert Nature Museum, first full weekend of each month.
- Fishing, Travel and Outdoor Expos, Rosemont and Schaumburg, January 23–26.
- Great Lakes Pet Expo, Milwaukee, February 1.
- Boy Scout Dinner, Lagrange Park, February 19.
- Reptile Rampage, Lake Forest, March 9.
- Kids' Expo, Schaumburg, March 8–9.
- Chicagoland Family Pet Expo, Arlington Racetrack, March 14–16.

Old Business

Junior Herpers: Thirty-six people attended the November meeting. The Notebaert wants to keep track of the attendance numbers.

There were no nominations from the floor for any board position at the October general meeting.

CHS 50th anniversary (2016): Jenny spoke with Don Wheeler and he would like to do the artwork for us.

New Business

O'Hare alligator: Much has been reported in the news media and many board members have been contacted by reporters seeking information. Mike Dloogatch thinks we should set up a "rescues@chicagoherp.org" email address that would be forwarded to all those concerned with rescues and adoptions.

Merit badge counselors: Jason is working to get more BSA involvement at 'Fest.

Awards: Jim Foster is working on this year's awards.

Dick Buchholz is working with people at the Notebaert to get more signage advertising our presence there, both animal displays and Junior Herpers.

Round Table

Rich Lamszus is happy to be a part of the CHS.

Mike Scott reported that he and his girlfriend were both bitten by Nancy's normally docile spotted python. This probably had something to do with the fact that both of them had been handling ferrets not long before.

Mike Dloogatch was waiting for a Metra train one below-freezing morning when he looked down and saw a dead baby gartersnake.

Teresa Savino has a friend at work who got a young leopard tortoise at NARBC and may join the CHS.

Linda Malawy is hosting the December board meeting and asked who was planning to attend.

Aaron LaForge got two snakes at SEWERFest and is still married!

Dick Buchholz reported that our table at the Three-in-one Expo went fine, but there were not a lot of people there other than vendors.

The meeting was adjourned at 9:05 P.M.

Respectfully submitted by recording secretary Jenny Vollman

Index to Scientific Names of Amphibians and Reptiles for Volume 48 (2013)

January 1-12
February 13-32
March 33-48

Acanthochelys macrocephala 8
Acris crepitans 49
Actinemys marmorata 85
Agkistrodon
  contortrix 173, 174
    laticinctus 122
    pictigaster 56, 58
  mokasen 103
  piscivorus 49, 153, 173, 174
Aldabrachelys 126
Alligator mississippiensis 152
Ambystoma
  cingulatum 78
  jeffersonianum 126
  laterale 78, 126
  maculatum 154
  texanum 49
  tigrinum 141, 144
    tigrinum 142
  tremblayi 78
Amietophrynus
  gutturalis 86
  maculatus 86
Anaxyrus
  punctatus 15, 16, 17
  terrestris 152
Anniella 13
Anolis 143
  conspersus conspersus 172
  sagrei 113
Arthroleptis xenodactyloides 86
Aspidoscelis
  exsanguis 58
  gularis 173
  hyperythra 107-108
    beldingi 107-108
  lineatissima 118
  scalaris gularis 16, 17
Astrochelys radiata 27
Barisia 13
  ciliaris 13, 17
Basiliscus vittatus 118
Boa constrictor 118
Bogertophis 43
  rosaliae 43, 44
  subocularis 43, 44, 58
Bothriechis
  guifarroi 75
  lateralis 75
Bothrops asper 25
Bufo
  bufo 61
  fowleri 167
Caiman crocodilus 60
Centrochelys sulcata 7

April 49-64
May 65-76
June 77-88

Chelydra serpentina 86
Chelonia mydas 172
Chrysemys picta 49, 113
Coluber
  constrictor 49, 85, 174
    flaviventris 122
    oaxaca 16, 17
  flagellum 85
    testaceus 16, 17, 101
  mentovarius 118
  schotti ruthveni 16, 17
  taeniatus 57
Cophosaurus texanus 39-42
Cranopsis periglenes 152
Crocodylus
  acutus 118
  acutus × rhombifer 172
  mindorensis 42
  siamensis 75
Crotalus
  atrox 16, 17, 45, 58, 136
  horridus 75, 129
  lepidus 56, 58, 72, 174
    lepidus 16, 17
  cf. molossus 15, 16, 17
  molossus 58
  scutulatus 58
  triseriatus 135-136
  viridis 58
Cryptobranchus
  alleganiensis alleganiensis 74
Ctenosaura pectinata 92-97, 118
Cubophis caymanus 172
Cuora
  amboinensis 28
  mouhotii 28
Cyclanorbis elegans 125
Cyclemys gemeli 28
Cyclura
  cornuta stejnegeri 150, 151
  lewisi 172
Cyrtodactylus
  agamuroides 133
  sagittifer 133
Cyrtopodion agamuroides 133
Dendrelaphis punctulatus 163
Dendrotriton rabbi 78
Dermochelys coriacea 114
Desmognathus
  folkertsi 77
  ocoee 154
Diadophis
  punctatus 163
    arnyi 66
Diploglossus 13

July 89-100
August 101-116
September 117-128

Dipsochelys 126
Dipsosaurus dorsalis 5
Drymarchon
  melanurus 118
    erebennus 17, 174
Drymobius
  margaritiferus 118
    margaritiferus 17
Echis coloratus 60
Ecnomiohyla
  miotympanum 16, 17
  rabborum 78
Elaphe obsoleta obsoleta 66
Eleutherodactylus
  coqui 149
  cystignathoides campi 16, 17
  juanriveroi 151
  longipes 16, 17
  monensis 149
Elgaria 13
  parva 14, 16
Emydoidea blandingii 86
Emys orbicularis 60
Epicrates
  chrysogaster chrysogaster 28
Eryx colubrinus loveridgei 89-91
Euphlyctis cyanophlyctis 133
Eurycea cirrigera 43
Farancia abacura 174
Gambelia
  sila 80
  silus 80
  wislizenii 79-82
Gastrophryne carolinensis 152
Geochelone platynota 142
Gerrhonotus 13
  infernalis 13, 16, 17
  parvus 13-19
Gloydius blomhoffii 26
Gopherus polyphemus 27, 142
Graptemys 28
  geographica 154
  ouachitensis 174
Hemidactylus 130-134
  brookii 130, 131, 133
  flaviviridis 130, 131, 133
  frenatus 118, 130, 131, 132, 133
  leschenaultii 130, 131, 132
  persicus 130, 131, 132
  robustus 130, 131, 132
  triedrus 130, 131, 132, 133
  turcicus 130, 131, 132, 133
Heterodon
  kennerlyi 58
  platirhinos 122, 153, 173, 174

October 129-140
November 141-156
December 157-180

Hierophis viridiflavus 45
Hyalinobatrachium aureoguttatum 26
Hyla
  andersonii 65, 66
  arenicolor 58
  chrysoscelis 65
  cinerea 152
  regilla 137
  squirella 152
  versicolor 174
    phaeocrypta 65
Hymenochirus 144
Hyperolius
  marmoratus 86
  nasutus 86
Hypsiglena
  chlorophaea 6
  jani texana 17
Iguana iguana 92-97, 118, 172
Incilius karenlipsae 77
Indogekko 133
Indotestudo elongata 28
Karsenia 78
Kinosternon
  flavescens 58
  hirtipes
    chapalaense 152
    magdalense 152
    megacephalum 152
  sonoriense longifemorale 45
Kinixys
  erosa 125
  homeana 125
Lampropeltis
  alterna 56, 57, 72, 174
  getula splendida 58
  mexicana mexicana 16, 17
  triangulum 27, 34, 35, 161
    gentilis 73
Lampropholis delicata 59
Leiocephalus
  carinatus varius 172, 173
Lepidophyma 14
  sylvaticum 17
Leptodeira
  maculata 118
  septentrionalis 17
Leptophis diplotropis 118
Leucocephalon yuwonoi 8
Lissotriton
  helveticus 61
  vulgaris 61
Lithobates
  areolatus 114, 153
  capito 60

catesbeianus 152
clamitans 114
forreri 118
pipiens 114
sphenocephalus 142, 152
Mabuya 85
Macrochelys temminckii 61, 86, 125
Malaclemys terrapin 65
Mediodactylus 133
Melanochelys tricarinata 28
Melanosuchus niger 60
Mesaspis 13
Micrurus 60
tener 17
Montivipera raddei 59
Myuchelys 126
bellii 126
georgesi 126
latisternum 126
purvisi 126
Nerodia 174
erythrogaster neglecta 49
fasciata 103
sipedon 33, 35, 102-106, 154
insularum 163
pleuralis 103
sipedon 105
Norops schmidti 118
Ollotis nebulifer 16, 17
Opheodrys
aestivus 174
majalis 17
vernalis 36
Ophibolus alternus 56
Ophisaurus 13
attenuatus attenuatus 66
Osteopilus septentrionalis 152, 172
Oxybelis aeneus 118
Pantherophis 75, 113
bairdi 16, 17, 174
emoryi 57
spiloides 174
vulpinus 6, 129
Pelophylax ridibundus 61
Phelsuma kochi 86
Phyllodactylus lanei 118
Phrynosoma
cornutum 57, 58, 66, 125
Physalaemus pustulosus 26, 74
Pituophis
deppei jani 16, 17
melanoleucus 28
mugitus 74
Plestiodon brevirostris pineus 16, 17
Plethodon
albagula 85
dorsalis 50
Podocnemis 61
expansa 61
sextuberculata 126
unifilis 61
vogli 61
Pseudechis porphyriacus 163
Pseudemys
concinna 49-51
gorzugi 173, 174
Pyxicephalus 83
Rafetus swinhoei 125
Rana
clamitans 28
septentrionalis 53
temporaria 61
utricularia 142
Regina 157
Rena humilis 118
Rhadinaea montana 15, 16, 17
Rhinella marina 118, 163
Rhinocheilus lecontei 16, 17, 58
Salvadora
grahamiae 57
lineata 16, 17
Scaphiopus
couchii 16, 17, 58
holbrookii 166-171
Sceloporus
couchii 15, 16, 17
graciosus 5
grammicus disparilis 16, 17
jarrovii 14
melanorhinus 118
merriami 174
minor 14
oberon 14, 15, 16, 17
occidentalis 5, 40
orcutti 4-6
parvus 16, 17
poinsettii 58
torquatus binocularis 16, 17
undulatus consobrinus 56
utiformis 118
vandenburgianus 5
Scincella
silvicola caudaequinae 16, 17
Senticolis triaspis intermedia 17
Sistrurus catenatus catenatus 61
Siwaligekko 133
Smilisca baudinii 16, 17, 118
Storeria
dekayi 2-3, 33-38, 157-165
texanum 3
wrightorum 3
hidalgoensis 17
occipitomaculata 35, 36, 163, 174
Syrrhophus modestus 118
Tantilla rubra 17
Tenuidactylus sagittifer 133
Terrapene
carolina 173, 174
bauri 142
carolina 142
ornata 65
Thamnophis
brachystoma 36, 163
butleri 36, 74, 153
cyrtopsis
cyrtopsis 17
ocellatus 174
elegans 6
gigas 154
marcianus 57
proximus
diabolicus 16, 17
rubrilineatus 174
sauritus 36
sirtalis 34, 35, 36, 74, 153
parietalis 65
valida 118
Tlalocohyla smithii 118
Trachemys 8
decussata angusta 172
scripta 49, 113, 118
elegans 174
scripta 145
Trimorphodon tau tau 17
Trionyx triunguis 125
Tropidodipsas sartorii sartorii 17
Tropidophis 26
caymanensis 172, 173
paucisquamis 26
taczanowskyi 26
Urosaurus bicarinatus 118
Uta stansburiana 45
Xantusia sanchezi 67-69
Xenopus 144
laevis 1-2, 141

Author–Title Index for Volume 48 (2013)

January 1-12 **April 49-64** **July 89-100** **October 129-140**
February 13-32 **May 65-76** **August 101-116** **November 141-156**
March 33-48 **June 77-88** **September 117-128** **December 157-180**

Adams, C. Letter 42
Archer, J. What You Missed at the January Meeting 24
Archer, J. What You Missed at the February Meeting 43
Archer, J. What You Missed at the March Meeting 56
Archer, J. What You Missed at the April Meeting 72
Archer, J. What You Missed at the July Meeting 111
Archer, J. What You Missed at the August Meeting 123
Archer, J. What You Missed at the October Meeting 149
Archer, J. What You Missed at the November Meeting 172

Banda-Leal, J., D. Lazcano and M. Nevárez-de los Reyes Notes on Mexican Herpetofauna 19: Herpetofauna Sympatric with *Gerrhonotus parvus* in San Isidro Canyon, Santiago, Nuevo León, Mexico 13

Barker, D. G. A Danger to Snakes in the Garden 101

Barker, D. G., and T. M. Barker The Measure of Experience 20

Barker, D. G., and T. M. Barker The Reproductive Husbandry of Kenyan Sandboas 89

Bishop, P. See Lindén, L. M.

Byers, O. See Lindén, L. M.

Cappiello, S. From City Girl to Field Biologist in 3 Months 120

Cochran, P. A. Additional Cases of Snakes Entrapped in Garden Netting: *Pantherophis vulpinus* and *Crotalus horridus* in Southeastern Minnesota 129

Cruz-Sáenz, D., J. L. Ortega de Santiago and D. Lazcano Notes on the Herpetofauna of Western Mexico 8: Diet Items of the Zacatecas Night Lizard, *Xantusia sanchezi*, in an Oak Forest of Jalisco, Mexico 67

Cruz-Sáenz, D., Á. Penilla-Juárez and D. Lazcano Notes on the Herpetofauna of Western Mexico 10: Herpetofauna of the Protected Natural Area "Estero El Salado" and Adjacent Areas in Puerto Vallarta, Jalisco, Mexico 117

Cruz-Sáenz, D., E. S. García Mata and D. Lazcano Notes on the Herpetofauna of Western Mexico 11: A Range Extension for the Mexican Dusky Rattlesnake, *Crotalus triseriatus*, in Jalisco, Mexico 135

Cruz-Sáenz, D. See also Penilla-Juárez, Á.

Eckert, K. Letter 9

García Mata, E. S. See Cruz-Sáenz, D.

Goldberg, S. R. Notes on Reproduction of Granite Spiny Lizards, *Sceloporus orcutti* (Squamata: Phrynosomatidae), from California 4

Goldberg, S. R. Notes on Reproduction of Greater Earless Lizards, *Cophosaurus texanus* (Squamata: Phrynosomatidae), from New Mexico 39

Goldberg, S. R. Notes on Reproduction in Long-nosed Leopard Lizards, *Gambelia wislizenii* (Squamata: Phrynosomatidae), from Southern California 79

Goldberg, S. R. Notes on Reproduction of Orange-throated Whiptail Lizards, *Aspidoscelis hyperythra* (Squamata: Teiidae),, from California 107

Gray, B. S. Aggregations of Brownsnakes, *Storeria dekayi* (Holbrook, 1836), at a Site in Northwestern Pennsylvania 33

Gray, B. S. The Relative Importance of Slugs and Earthworms in the Diet of Dekay's Brownsnake, *Storeria dekayi*, from Northwestern Pennsylvania 33

Harbsmeier, C. L. Letter 29

Johnson, S. R. Half-time Herping on One Big Prairie 65

Johnson, S. R., and M. Stark Brown Snakes (*Storeria dekayi*) in South Central Iowa 2

Khan, M. S. An Addition to Geckos of the Genus *Hemidactylus* Oken 1817 in Pakistan, with Notes on Morphology, Ecology and Distribution of Species 130

Lazcano, D. See Banda-Leal, J.

Lazcano, D. See also Cruz-Sáenz, D.

Lazcano, D. See also Penilla-Juárez, Á.

Lee, D. S. Review: *The Tortoise* and *The Batagur*: Two Periodicals for Turtle Enthusiasts 7

Lee, D. S. Review: *Thirty Seconds before Midnight* by Helen J. Beal 52

Lee, D. S. A Primer on Ranaviruses 141

Lindén, L. M., P. Bishop and O. Byers Letter 9

Lindén, L. M., P. Bishop and O. Byers Letter 112

Miller, R. W. Notes on the Distribution of *Scaphiopus holbrookii* in Maryland 166

Nevárez-de los Reyes, M. See Banda-Leal, J.

Ortega de Santiago, J. L. See Cruz-Sáenz, D.

Palis, J. G. Serendipitous Sightings of *Pseudemys* in Southern Illinois 49

Palis, J. G. Book Review: *The Eponym Dictionary of Amphibians* by Bo Beolens, Michael Watkins and Michael Grayson 77

Pawley, R. Letter 136

Penilla-Juárez, Á, D. Cruz-Sáenz and D. Lazcano Notes on the Herpetofauna of Western Mexico 9: Current status of Green Iguanas (*Iguana iguana*) and Western Spiny-tailed Iguanas (*Ctenosaura pectinata*) in the Protected Natural Area "Estero El Salado" in Puerto Vallarta, Jalisco, Mexico 92

Penilla-Juárez, Á. See also Cruz-Sáenz, D.

Salmon, G. T. See Wallach, V.

Sievert, I. Frog City: I. *Xenopus* leave-us 1

Sievert, I. Frog City: II. A Trying Guest Arrives Unannounced 22

Sievert, I. Frog City: IV. Mom's Minks 53

Sievert, I. Frog City: V. A Green Thought: Part 1 70

Sievert, I. Frog City: VI. Living in Captivity 97

Sievert, I. Frog City: VII. A Green Thought: Part 2 83

Sievert, I. Frog City: VIII. An All-American Toad 109

Sievert, I. Frog City: IX. Only Herpetology, or, What Frogs Do for Me 121

Sievert, I. Frog City: X. House Music 137

Stark, M. See Johnson, S. R.

Wallach, V., and G. T. Salmon Axial Bifurcation and Duplication in Snakes. Part V. A Review of *Nerodia sipedon* Cases with a New Record from New York State 102

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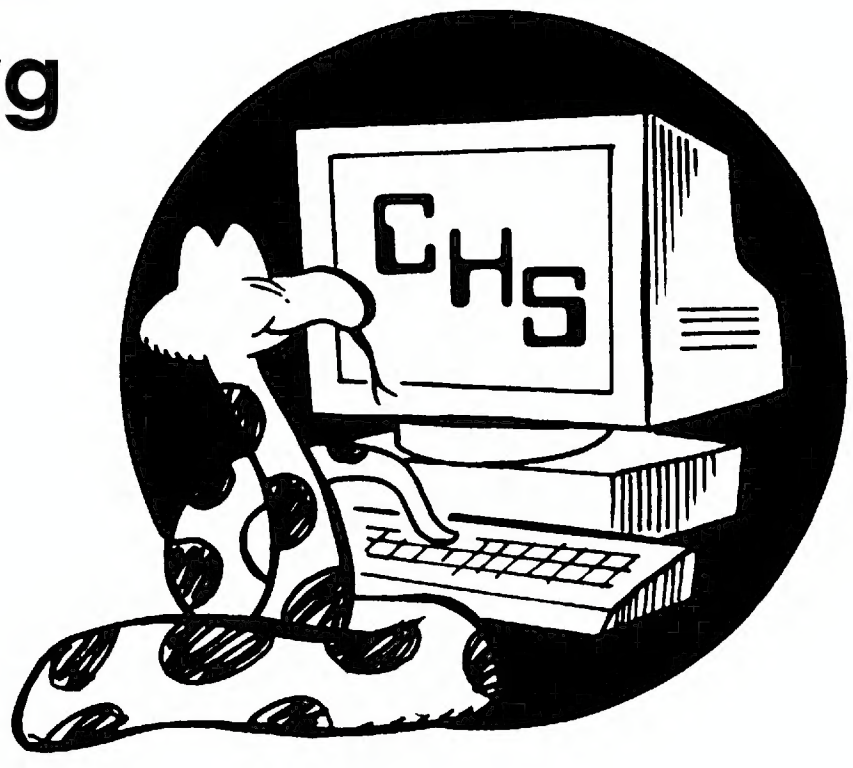

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Line ads in this publication are run free for CHS members—$2 per line for nonmembers. Any ad may be refused at the discretion of the Editor. Submit ads to mdloogatch@chicagoherp.org.

UPCOMING MEETINGS

The next meeting of the Chicago Herpetological Society will be held at 7:30 P.M., *Thursday*, December 26, at the Peggy Notebaert Nature Museum, Cannon Drive and Fullerton Parkway, in Chicago. **This meeting will be a holiday party**. The CHS will provide soft drinks and snacks. If you would like to bring something edible to share with the group, you are invited to do so. If you would like to bring an animal to show off to the group, you are encouraged to do that as well. This will be a chance to socialize all evening and get to know your fellow members a little better.

Dr. Joe Milanovich will speak at the January 29, 2014, meeting about "Amphibians and Global Change: What do we Stand to Lose?" In August 2013 Joe joined the faculty at Loyola University Chicago as an Assistant Professor in the Department of Biology. He teaches Ecology and his research examines the impact of global change on amphibians and the importance of herpetofauna to ecosystems.

The regular monthly meetings of the Chicago Herpetological Society take place at Chicago's newest museum—the **Peggy Notebaert Nature Museum**. This beautiful building is at Fullerton Parkway and Cannon Drive, directly across Fullerton from the Lincoln Park Zoo. Meetings are held the last Wednesday of each month, from 7:30 P.M. through 9:30 P.M. Parking is free on Cannon Drive. A plethora of CTA buses stop nearby. Free parking is available in the walled-in area to the south of the loading dock ramp.

Board of Directors Meeting

Are you interested in how the decisions are made that determine how the Chicago Herpetological Society runs? And would you like to have input into those decisions? If so, mark your calendar for the next board meeting, to be held at 7:30 P.M., January 17, 2014, in the adult meeting room on the second floor of the Schaumburg Township District Library, 130 S. Roselle Road, Schaumburg.

The Chicago Turtle Club

The monthly meetings of the Chicago Turtle Club are informal; questions, children and animals are welcome. Meetings normally take place at the North Park Village Nature Center, 5801 N. Pulaski, in Chicago. Parking is free. For more info visit the group's Facebook page.

ELECTION RESULTS

As a result of the elections held November 28, 2012, the following officers and members-at-large will serve on the CHS Board of Directors for the year 2013.

President:	John Archer	Membership Secretary:	Mike Dloogatch
Vice-president:	Jason Hood	Sergeant-at-arms:	Dick Buchholz
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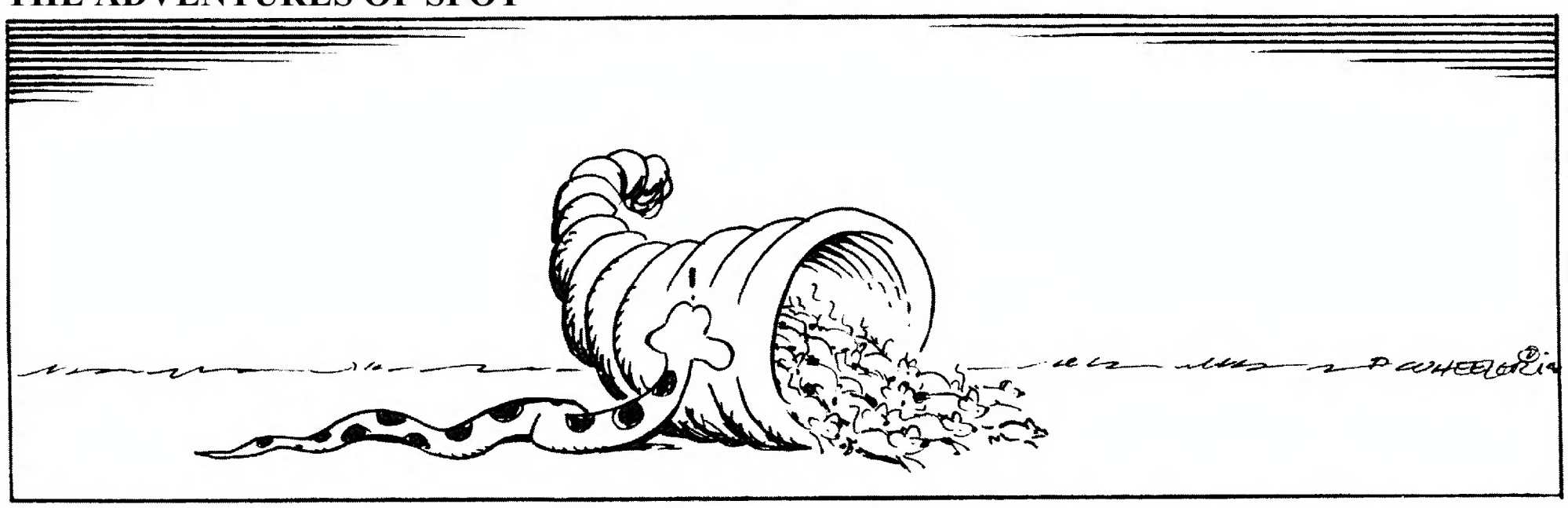

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